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USE OF ARTIFICIAL INTELLIGENCE FOR THE GENERATION OF MEDIA CONTENT

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Abstract: Artificial intelligence (AI) is a powerful catalyst that enables media organizations to optimize and improve their operations. The aim of the paper is to emphasize the importance and potential of AI during high-performance data analytics and media content generation. The focus is on responsible and ethically acceptable use of AI, which imposes the need to continuously build trust, through numerous challenges, during the management of potential risks. Standardization and mandatory publication of AI product data can pave the way for increased transparency and trust building. Otherwise, the power of AI, which has a huge potential to contribute to a better quality of life, could be transformed into a suicide tool.

Keywords: *artificial intelligence, media, ethics, security, and reliability.*

Introduction

Artificial intelligence (AI) is a branch of computer science that deals with the ability of a machine to imitate intelligent human behavior. It has the potential to help solve some of the world's most challenging social problems (Sadiku et al., 2021). Predicting future trends in the media industry is one of the biggest challenges, not only because of the number and variety that are conditioned by technological changes, but also because of the increasingly demanding media audience that expects personalized content. In this context, the role of AI, with its huge amount of data and analytics, occupies a key position at every stage of the value chain (Bhandari, 2020):

- *The role of AI in content creation* – Predictive analysis of consumed viral media and sentiment analysis of consumed owned media can provide guidance on future content trends;
- *The role of AI in content aggregation* – AI-driven automatic tagging of media metadata can help connect different media and identify appropriate content;
- *The role of AI in content distribution* – AI can be used to recommend the right content, in the right format and at the right time, to audiences to increase engagement;
- *The role of AI in content consumption* – Based on content consumption analysis and sentiment analysis, future trends can be rediscovered or enhanced.

By knowing what individuals want to see in the future, and correlating with their preferences, AI can enable media and publishing companies to make relevant investment decisions in creating appropriate content for their audience.

AI can create conditions for identifying potential subscribers, and thus contribute to the financial empowerment of the media, whose stability and development is positively correlated with the number of subscribers and ads. With the changing focus of interest, media companies are given the opportunity to create enhanced options to retain existing subscribers and advertisers.

Pointing out that the media already started to apply the technology of “intelligent enterprises” at the beginning of the 21st century, Čitić (2020: 1331) states that in 2020 the SAP (*Systems Applications and Products in Data Processing*) platform was represented in 151,000 companies, in 188 countries, combining database and memory processing, providing libraries for planning, word processing, forecasting, spatial and business analytics.

Using AI to process and analyze data at the source of its collection, provides media organizations with the advantage of collecting, analyzing and taking action in real time, as well as predicting what is to come. It is a powerful platform that provides organizations with a significant competitive edge in innovation, creativity and numerous performances in the dynamic and changing media market.

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Media coverage of issues related to the use of AI has the potential to drive public discourse ranging from new technologies to ethical issues. Studying the way in which the ethical issues of AI are presented in the media can lead to better insight into the potential consequences of the development and comprehensive regulation of AI application. There is research that suggests that the media has a fairly realistic and practical focus in reporting on AI ethics, but that coverage is still insufficient and superficial. Authors Ouchchy, Coin and Dubljević (2020) emphasize the necessity of a multifaceted approach to solving social, ethical and political issues of AI technology. This includes increasing the availability of accurate information, to the public, in the form of fact sheets and ethical statements on trusted websites, followed by cooperation and inclusion of ethics and AI experts in research and public debates, as well as consistent government policy or regulatory frameworks for AI technology.

Ever more medias are accepting the inevitable changes that are redefining business activities, to a great extent, by using advanced technology to publish more and better content. Of course, it is not just about textual content, voice cloning for online media is increasingly being used through hybrid workflows. In this manner, the fact that AI is an ally, and not a substitute, for journalists is accepted. Essentially, the work of journalists will not change, but it is realistic to expect that the way they deal with their demanding and complex business activities will change rapidly.

1. AI as a new reality

AI represents a stable basis for rational analysis and reconstruction of most dimensions of intelligence, with the help of computers. Fear of ethical risks stems from the fact that machines exceed our cognitive abilities. Ganascia (2018) differentiates possible risks into those related to lack of work, given that it can be performed by machines instead of people, followed by consequences on the autonomy of individuals, especially in terms of freedom and security, and then overtaking humanity which would be replaced by “more intelligent “ machines. However, it should be noted that, at least for now, work is not disappearing, but changing and requiring new knowledge, skills, and personalities. In addition, if we look objectively at the autonomy and freedom of individuals, we can notice that the guarantees of their preservation are found in maximum and continuous vigilance and pre-prepared responses to potential unwanted circumstances.

Recognizing the unstoppable process of globalization, the dynamic and changing media market, AI plays an increasingly important role in the implementation of informative, educational, entertaining, but also advertising content, based on the value of leased space and/or time, as well as on the basis of comparison with other media.

Establishing trust in AI is one of the key issues on which future development will be built, in order to reduce potential vulnerability, and bias, to zero. IBM (*International Business Machines Corporation*) company, which operates in more than 170 countries, constituted elements that form the basis for reliable AI systems (Mojsilović, 2018):

- *Fairness* – AI systems should use training data and models that are unbiased, to avoid treating certain groups unfairly;
- *Robustness* – AI systems should be secure, not subject to manipulation or compromise of the data, for which they are trained;
- *Explainability* – AI systems should make decisions or suggestions that can be understood by their users and developers;
- *Provenance* - AI systems should contain details of their development, implementation, and maintenance so that they can be audited throughout their life cycle.

Bringing down the level of bias, in media discourse, to an acceptable level is a big challenge faced by the media: information intended for the public is often, intentionally, or unintentionally, tinged with bias, that is, misleading, instead of fact-based. Unlike the creators of media content in traditional and digital media, AI decisions are subject to continuous control and correction based on an established algorithm. However, despite the large number of variables, the products of AI in the media industry are not absolutely devoid of subjectivism and bias, considering that the final products are strongly influenced by editors - supervisors, i.e., their subjectivity, prejudices, and biases.

Whether it is a human or a machine that writes reports, the process must be transparent, that is, someone must be responsible if the public is to believe the story. However, computers

can also be biased and the reason is that we still live in a human-driven world where data reflects human activities, including our biases and mistakes. In order to demystify this problem, openly pointing out data limitations has been suggested (McCarthy & Kunova, 2021).

Abebe (2018) acknowledges that AI has the potential to solve a range of problems and challenges, but points out that there is a growing disconnect between the people who introduce and adopt AI-based solutions and those who set policies, for whom and how these solutions are implemented. The author substantiates the claims with the existence of algorithmic bias in the AI system, where machine learning algorithms, are created according to data, to reflect conspicuous historical discrimination through replication, even magnifying it. The problem is recognized in an inadequate focus on the contribution of AI that improves the lives of marginalized communities and economically vulnerable populations, whose interests are not sufficiently visualized by society.

Devices that support AI have greater possibilities for manipulation and cause addiction in users, with children being the most vulnerable category. In the absence of precise and unambiguous recommendations, parents are left to make decisions about products with incomplete information and complex implications for children's health and privacy. In this context, the platform of the World Economic Forum for shaping the future of technological management narrows multiple activities to three strategic pillars (World Economic Forum, 2022):

- Education: it is necessary to develop practical and effective frameworks and tools to educate and inspire children, adolescents, parents and guardians regarding the responsible use of AI;
- Empowerment: Children and youth need to be empowered with AI skills to create their own technology, aimed at improving the world, with an emphasis on underrepresented voices;
- Protection: Establish protections and expand children's human rights and civil liberties when they encounter AI in their homes, schools and public spaces.

2. AI in social networks

New media, or media of the new age, with its most important interactive feature, are not only the most cost-effective, but also allow access without space and time limitations, creating a virtual reality. In addition, an important comparative advantage in relation to traditional media is communication that is realized in real time, through the transfer, processing, storage, and distribution of media content in various formats. Henry (2019) states that accessibility, data access speed, reversibility and storage capacity are the basic parameters that characterize new media. Essentially, computer programs allow users to supplement the real-world environment with computer-created objects, while more broadly, virtual reality, intelligent systems, and automation are slowly replacing various aspects of industry, human interaction, and paving the way for comprehensive progress.

Sančanin and Čerović (2021) point out that the special feature of social media is not only that they enable the introduction of new users, but also that they give companies a new, stronger visibility, which gives practitioners the opportunity to significantly speed up and simplify the segmentation of target groups.

The continuous growth in the number of users of social networks essentially has an increasingly visible influence from AI. The reasons for the continuous rise of Facebook are reflected through the understanding and acquisition of knowledge about user behavior, as well as thanks to the huge database and techniques it uses (Rangaiah, 2020):

- *Deep learning* - this technique is based on understanding the context of images and videos. For example, if cars appear frequently in images and videos, ads with that content will be placed on that insight;
- *Deep text* - is a technique that uses neural networks, with its own algorithm, to analyze words in user posts in order to understand their context and meaning;
- *Face recognition* - this technique enables face recognition on the basis of two or more comparative, different photos.

Large platforms such as Facebook, aggregate content, and services more efficiently than traditional media can, capitalizing on user-generated content and algorithms to transform it predictively. In addition, major platforms now act as powerful channels for content distribution, while traditional media organizations have become content providers for these platforms

(Trattner et al., 2022). In such a created realistic environment, responsible media must strengthen their position by highlighting its comparative advantages, through the reliability of information sources and ethics, as well as to strongly continue with the process of content personalization, according to the wishes and expectations of the target audience.

Other social networks use similar algorithms: thus, Twitter uses AI to mark and remove accounts that detect hate speech or promote extremist groups. Instagram uses a huge database that allows users to more efficiently search for images that prefer their activities and experiences, while LinkedIn, as a primarily business-oriented social network, establishes connections with a job recommendation.

Today, tools with AI provide the opportunity to build an audience and convert followers into potential customers through numerous activities (Kaput, 2021):

- Creating posts on social networks;
- Optimizing a campaign on social networks;
- Detecting posts that give the best results using advanced analytics;
- Finding a target group;
- Writing advertisements;
- Measuring brand and trends on each social media channel;
- Social media monitoring;
- Reducing the time and cost of managing social media across different platforms.

Several research studies carried out from 2008 to 2011 in Serbia, which studied the daily time economy of inhabitants, measured the volume of face-to-face communication, which was realized through the Internet primarily via social networks. In 2008, face-to-face communication was 20 times greater than that mediated by the Internet, in 2009 it was 12 times, and in 2011 only 5.5 times. If this trend were to continue linearly, then the duration of face-to-face and communication on social networks and media would equalize by 2024. (Branković, 2017: 10)

Social networks enable direct communication and interactive contact with the target group, i.e., they provide enviable breadth and profitability, as pointed out by Sančanin (2022), who warns that this kind of communication does not provide the necessary security, especially in correlation with control in traditional media. This represents a visible insufficiency but not so significant that it would represent an obstacle for even more frequent use of social networks in the future.

3. AI in modern journalism

AI can use algorithms to create media content through the process of converting data into text, images and videos. In literature, such activities are also defined as automated journalism or robotic journalism, but mass application has been absent due to the objective fear of losing journalistic and editorial jobs, as well as the impossibility of preventing the generation and distribution of false content.

Advanced AI techniques are increasingly present in the design of hybrid workflows between media creators and AI, making that process visible through the analysis and creation of numerous and diverse media contents, starting from marking and selecting data, writing news, modeling comments, all the way to checking fact and content verification (Trattner et al., 2022).

The importance of AI can primarily be confirmed by its relevance in the process of creating multimedia content. Based on predefined criteria and previous experience, the algorithm recognizes visual content that could be acceptable for different textual content.

The AP (Associated Press) agency has identified five areas for journalistically relevant subdomains of AI: machine learning, natural language (processing and generation), speech (text-to-speech and speech-to-text), vision (image recognition and computer vision), and robotics. Practically, AI can enable journalists to analyze data, identify patterns, trends and specific insights, from multiple sources, then convert data and spoken word to text, text to audio and video format, as well as understand feelings, analyze scenes for objects, faces, text or color. In this manner, two significant arguments for the application of AI in newsrooms were profiled: journalists are freed from their daily tasks and their ability to understand more data increases (Schmidt, 2017). Back in 2013, the AP began using AI for its sports news and earnings reports. NewsWhip analytics were used to ensure a position ahead of social media trends

In 2016, the Washington Post used Heliograph software to cover the Rio Olympics. The first step was to analyze data, then merge the expressions with the relevant story template and

create an automatic narrative. The upside was that it was easy to find anomalies among the data.

Reuters extends graphic solutions, i.e., uses data visualization techniques for sports news and entertainment topics. It's a new way of publishing visually stimulating, easy-to-understand data-driven news, using algorithms to continuously create, update and access data.

The BBC has a substantial amount of data from daily news, features and videos, and the tool tracks sources, extracts and articles from the BBC and other global media outlets. Relevant stories are tagged with simultaneous segmentation into locations, people, organizations, and things. (Cognixia, 2019).

Even now, AI can save time during the authentication of photo, audio and video transcripts, and many reports that rely on huge databases. However, it is only the basis on which journalists can check the facts, analyze, and contextualize the collected data, which leads to the conclusion that people must remain at the center of the entire journalism process (RTS, 2020).

Investigating what the fourth wave of digital transformation means for public media service journalism, EBU (*The European Broadcasting Union*) (2019) indicated that the new wave, after online, mobile, and social media, will be defined by the opportunities and threats of AI and data technology. Despite the dilemmas and unanswered questions, more and more people are recognizing the potential of AI to make journalism more valuable and inspiring for audiences.

The report on AI in journalism, based on a survey of 71 news organizations in 32 different countries, showed that AI is already occupying significant positions in journalism, giving media content creators more power and adding greater editorial and ethical responsibility, but unevenly distributed. Slightly less than half of the respondents said that they use AI for news gathering, two-thirds emphasized that they use it for the production of media content, and slightly more than half of the respondents emphasized that they use AI for distribution. Research results have shown that there is a general desire for more efficient work, in order to free up the resources necessary for a more functional newsroom and for new or improved content (Beckett, 2019).

Media transformation, in the new digital reality, constitutes a hitherto insufficiently recognized responsibility towards digital channels and created content. It also establishes new relationships between investment and education of media discourse creators. In addition, Plenković (1980: 38-39) opened a communication dilemma as to whether media, in the public media discourse, should credibly and valuably present creativity in which there is enough space and time for everything, or if the focus should be on one type of creativity. In the first case, the path can lead to media discursive anarchism, while the second impoverished option can subordinate creative creativity to media sponsors and political-managerial pragmatism.

Almost without exception, journalists argue that AI can augment, but not automate, the media industry by enabling journalists to break news faster while freeing up time for deeper analysis. In this sense, Francesco Marconi (2020), who led the development of the use of AI in the journalism of the Associated Press and the Wall Street Journal, offers a new perspective on the potential of these technologies. The author marks the media landscape transformed by AI for the better and emphasizes the constant need for editorial and institutional oversight.

AI and machine learning have been part of the media landscape for several years in the form of a personalization system that adjusts media content based on the user's previous online actions, i.e., based on the digital traces left by the user. In this context of default low privacy, Sundar (2020) points out that rules governing the media behavior of individuals, by machines, can cause privacy concerns and threaten human activity, with personalization (the media system surreptitiously creating content for users) less desirable than adjustments (the user adjusts the desired content himself).

Possible resistance within media organizations regarding the use of AI is a consequence of insufficient recognition of the essence of the problem: journalists are not interested in facts about how AI works, but what it does. The moment newsrooms provide storage space for huge amounts of data and effective tools powered by AI, the transformation of data into narratives will become a reality that cannot be lived without.

Conclusion

It is realistic to expect that in the near future digital media will give way to emotional-intelligent media, thus confirming futuristic announcements that technological progress will

have even greater reach than it had in the 20th century with the advent of radio, television and the Internet.

What is encouraging is that the implementation of AI unlocks the door to the maximum diversification of available media products, and the significant improvement of innovative and creative media creation based on huge databases, as well as the adoption of algorithms, that will ensure an adequate selection of the necessary data from the hyperproduction offer.

The scope of future integrative research should raise the bar of quality and practical applicability of AI, considering the needs and expectations of the media industry, as well as minimize potential risks, striving towards zero tolerance.

AI already has a strong impact on journalism, but it also has, undoubtedly, great potential for thinking about economic viability and proactive action aimed at protecting the public interest, in the media industry, burdened with misinformation and content that lacks credibility and relevance. In such a defined media environment, journalists are expected to maximize the use of tools with AI, in order to focus on their basic work while saving time and money.

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SECURITY OF THE SYSTEM FOR ELECTRONIC LEARNING

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Abstract: Security is one of great problems in the creation and implementation of e-learning solution. As an end user is not able to see these problems, they are often neglected. As all other applications, e-learning portals are widely distributed and available to a wide audience, which makes them vulnerable in a way. As the concept of Web applications is very spontaneously developed without a detailed plan, and with great effort invested in development of programming languages and interpreters for Web applications, there is a danger from manipulation by malicious users.

Keywords: *e-learning; education; security; attacks.*

I. INTRODUCTION

Basic security requirements are:

- Confidentiality – it refers to the belief that information and data, which imply something secret and private, will not be discovered by unauthorized persons, processes or devices. Namely, students need to be sure that their exams, which they have taken on-line, are kept private and that they can be accessed only by authorized users – teachers.

- Integrity – it refers to the belief that information and data will not be, accidentally or with malicious intent, modified or destroyed and that they will retain their accurate, correct and complete original form. Namely, the students need to be sure that their exams, taken on-line, reach the teachers in their original form.

- Availability – it refers to the belief that information and communication resources are available and reliable in a timely manner to authorized persons. Namely, the students need to be sure that they have a reliable and timely access to e-learning system when they want to take their exams in time.

Emergence of electronic communications, particularly the Internet, has significantly influenced the increase of frauds and identity thefts. For that reason, identity protection has become crucial in cyberspace. Basic and recognizable set of characters of an entity is what constitutes the identity, and it is also the thing that enables the others to be different from the rest. Such concept suggests that there aren't two same identities and that each identity is associated with a single set of characters that is unique to him. In on-line environment, the identities of users are digital identities.

The simplest way to ensure the protection of digital identities is the use of user login. All it takes is user ID and password of the user. As a result, user login provides three crucial access services of identity:

- Identification – recognizes the user as a true member of user association,
- Authentication – verifies user identity and
- Authorization – authorizes the access to specific resources.

Secure login system provides: control – review of user's on-line transactions; jurisdiction – linking user actions; recognition – elimination of activities that were rejected by the user

II. SECURITY MODEL OF DISTANCE LEARNING SYSTEM

A security model of distance learning system is based on role policy [4]. If it is assumed that U – is a set of users; G – a set of user groups, which consists of the following elements: $G = \{\text{administrator, teacher, student, guest}\}$; P – is a set of authorizations to access the objects, presented in a matrix of access rights; S – set of user sessions in the system.

For these sets, the following relations can be defined [6]:

$PA \subseteq P \times G$ - shows how the set of authorizations is reflected on the set of groups, where

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tools, indicated by those authorizations, are installed for each group; $UA \subseteq U \times G$ - shows how the set of users is reflected to groups, defining the tool to access the groups for each user.

Security rules of access policy control and define the following functions:

User: $S \rightarrow U$ – for each session, S function defines the user, who accomplishes this session with the system:

User(s)= u ; group: $S \rightarrow P(G)$ – function defines tools from the set G for each session s , which can be simultaneously available to user in this session:

$$group(s) = \{g_i, | (user(s), g_i) \in UA\};$$

Authorization: $S \rightarrow P$ – this function will mark tools necessary for authorizations in sessions, authorization is defined as a set of authorizations of all groups, used in this session:

$$authorization(s) = U_{g \in group(s)} \{p_i | (p_i, g) \in PA\}$$

As a criterion of the security model, the following rule uses the following formula:

$$\forall u \in U, \exists p \in P, \exists s \in S$$

$$(u = user(s) \& p = operation_i(s)) \rightarrow \\ p \in authorization(s)$$

Where the operation(s) – is a function that will mark authorization for action number i .

In that way, the system is secure if any system users, who operates in session s , can accomplish actions, requiring the authorization p only in that event, and if p belongs to the set of available rights of session s .

III. APPLICATIONS FOR E-LEARNING COURSES

Many applications were developed as support in the preparation of *e-learning* courses. All those applications perform some common functions [5]:

Administration – application of administration is designed for the purpose of managing administrative information of an institution/organization. Administrative information is very sensitive, given that it refers to personal information. These tools are aimed at enabling the administrators to manage the important information of an institution/organization in an easy way.

Authorization of courses – many distance learning courses are designed to be accessible over the Internet. As a result of that, there is a need for rapid development of tools for multimedia courses.

Delivery of course content – after the *on-line* course is designed, it is necessary to deliver it by appropriate tools. These tools provide the students with the access to *on-line* courses over the Internet. On the other hand, students can have a variety of devices and tools and they can move them on various platforms.

Synchronous communication – some tools are made in such a way to support synchronized activities between instructors and students. Typical example of that is a tool for a video conference that is designed in such a way that activities, such as visual communication “*face-to-face*” and audio communication, require synchronization between communication parties. Although these tools are useful, they also have their disadvantages. First of all, they require the expansion of network scope, which will support communication requirements.

Multimedia lectures – some applications offer tools for synchronization of video “*slide show*” presentation. These multimedia applications aim at providing the learning environment that is similar to the traditional learning environment.

Assessment of students’ knowledge – it is a challenge for each instructor to assess the knowledge of students and determine how well the student handles *on-line* courses. Different tools that support *on-line* testing were made. These tools tend to focus on the creation of *on-line* exams or to monitor students’ logins.

IV. TYPES OF ATTACKS ON E-LEARNING SYSTEMS

Some of the types of attacks are browser kidnapping, theft of cookies, theft of database, changes of access rights, i.e. DoS (Denial of Service), SQL/HTML injection, cross-site inclusion etc. [3] HTML injection is an attack that is done by entering HTML/JavaScript code in the text fields that should, later on, be shown on one of the pages of Web application [2].

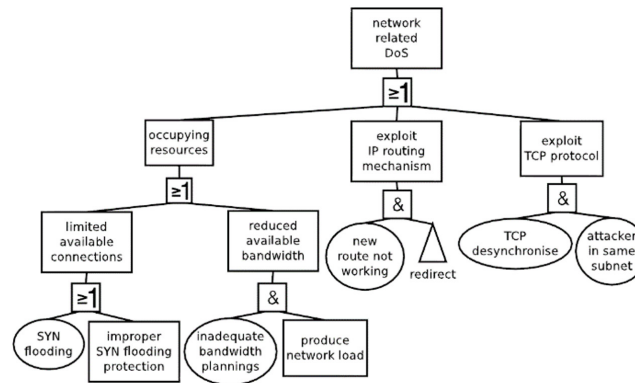


Figure1. Fault tree excerpt for network related denial of service (DoS)

Such failures are often used for so-called “session thefts”. Each user who visits the page that contains a malicious code, including the administrator, is a potential victim of the attack. The attacker can write a code by which he can record all cookie variables from user’s browser on a remote location, including those that contain sensitive data, such as session’s identification number. The attacker can then present those cookie applications as his own, and the application will, by the identification number of attacker’s session, see the attacker as the one whose cookie is stolen. In that way, if the attacker steals administrator’s cookie, he will have all the privileges in the application including editing and deleting the content and user accounts. SQL injection is another very frequently used technique [1]. It is relatively similar to HTML injection, but it is even more dangerous. This attack allows the attacker to edit or read arbitrary entries from SQL base, and this can be used in many ways, such as by creating new administrator’s user account.

Security gaps are found in two basic ways:

- By brute-force access, i.e. by testing all the possible failures “blindly”.
- By reading the application code and analyzing it.

From all this, it follows that only well-checked cryptographic algorithms should be used (RSA; DES, Blowish, MD5, SHA,...), instead of writing own solutions. Verification of important information should be done on server’s side that is opposed to client-side of language. Thus, security-critical information must not be verified, and an important code must not be located in languages that are performed on client-side (JavaScript, Java, VBScript, Flash, ...). All input data should be “cleaned” from potentially dangerous parts by deleting HTML and JavaScript from the text that the user sends to be presented on web pages or provides the translation of special characters into equivalents for the use in SQL queries. So, web applications are most frequently written in languages whose code is never compiled, but it is interpreted, i.e. their code is readable. One of the most common techniques for hiding the code is obfuscation. Obfuscation is coding (not encryption) of the code, for the purpose of reducing its readability. It is aimed at reducing “the sense” of the written code by changing the names of variables, functions, classes, to replace as many codes by equivalent etc. In case of using PHP, most frequently used solution is ZendGuard that partially compiles the code into so-called bytecode, in addition to obfuscation. It should be stressed that regardless of all this, there is no completely secure way to hide a code if the executable file is in question.

V. SETTING THE SECURITY ASPECTS OF APPLICATIONS FOR E-LEARNING COURSES

Web sites consist of client and server components. By this classification, it can be said that the system is completely secure as long as it is in the context of the client, because it actually does not have anything to do with the server. However, in the moment when a user-defined process takes place on the server, one site becomes vulnerable.

What happens in the process of broadcasting one static HTML page? Client application sends a request to *web server* and web server responds by finding and broadcasting the requested *HTML* document. In such process, there is no room for anything, except for the mentioned series of activities and, because of that, this application is secure.

In process of creating and broadcasting dynamic web side, this process has a few more steps. In the beginning, and here, the client application requires a particular document, but the server, instead of finding and forwarding that document, forwards the entire request to server script and it processes it and transmits on the output (to the client). This processing is a key point for security of one *web* application, because if the user succeeds to infiltrate its part of the code in server script, it will have “unlimited” possibilities to manipulate the server.

Therefore, the input is the most vulnerable part of the application. For that reason, it is the most important to be sure about everything that enters the application; and that security will, of course, be accomplished by controlling all “inputs”.

A. What are the inputs into a web application?

In order for the user to reach the server code of an application (through that application), it is necessary to turn to it through some parameters. These parameters, usually, reach the application through the forms (*post*) or parameterized *URL string (get)*. When some of these parameters reach the server, server puts it into an appropriate variable. These variables are unique and available to the complete context of application and, for that reason, they are called superglobal variables.

Most of the superglobals, in case of each request and response, pass the way from a client to server and vice versa and, therefore, they are considered unclean and they need a special treatment in order for their use to be secure.

B. The concept of black and white list

A lot of intrusions into application occur through controls that are, generally, an insecure source. For that reason, in case of every such information input, a certain filtration is performed. Primarily, it should be devised what is to be filtrated.

When you are filtrating data, the application can be said to do one of the two things:

- not let anyone in who does not meet particular conditions,
- let only those who have met particular conditions.

These two concepts are called black and white list.

Difference between these concepts is in the fact that black list requires much less attention, because, after we list the objects that do not have the access to the structure, it will be available to all other objects even if the list is not timely refreshed.

On the other hand, white list requires a more regular refreshing, depending of the frequency of objects. White list is considered to be a better security concept than black list, because the input is limited only to the values expected, and thus the undesired object has much less chances to pass.

C. Input

The first vulnerable point in the system is superglobal variable, and that is simultaneously the place where server code has a possibility of a control.

The first thing that can be controlled is whether the user is appropriate or not. In case that it is a user that is not registered in the system, it can be verified from where it came. The location from which the user came is called **referrer**.

If it is expected for the user to be registered in the system, the systemic verification is done (through the *cookie*, *session* or *base*).

When the user is verified, the following point is the input itself, i.e. superglobals that contain that input. In *web* applications, the user can cause serious harm only through a server or

SQL script. For that reason, such an input is most frequently necessary to be prevented; the best way is to forcing the user to enter exclusively valid content.

VI. CONCLUSION

Development of many e-learning courses is most frequently based on technical details, as well as the manner of their delivery. Security, as the need of these systems' existence is frequently neglected. Namely, the role of security in e-learning systems is to provide a secure „end to end” session between students and *e-learning* network, where security is treated as a technical element.

Observed from the perspective of students, security in *e-learning* environment is focused on something else. The ability of a student to manage his own space, especially when personal information is shared, is very important. In *e-learning* environments, when physical interaction practically does not exist, the confidence is essentially important.

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TEORIJA ORGANIZACIJE U NOVOM DIGITALNOM OKRUŽENJU

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Abstract: Savremena teorija organizacije mora da uzme u obzir uticaj novih disruptivnih tehnologija na organizaciono teoretisanje i odnos između organizacionog dizajna, strukture i performansi. U radu polazimo od pretpostavke da organizacije nisu uvek konsenzualne jer različiti ciljevi unutar organizacije odražavaju posebne interese i potrebe različitih steikholdera, koji mogu biti u sukobu jedni sa drugima. Blockchain tehnologije omogućavaju da se preko algoritma, dakle automatizovano, utvrdi konsenzus u decentralizovanoj mreži bez pribegavanja spoljnom autoritetu za odlučivanje i sprovođenje. Tehnologija distribuirane knjige (DLT), uz pomoć veštačke inteligencije i pametnih ugovora omogućava uspostavljanje organizacije bez menadžmenta ili zaposlenih, potpuno konstruisanu korišćenjem koda. Kao rezultat toga dobijamo decentralizovanu autonomnu organizaciju (DAO), u kojoj AI algoritmi deluju potpuno autonomno. Ovaj rad razmatra DAO kao mehanizam koji funkcioniše autonomno, automatski usaglašava interese i radikalno menja donošenje odluka unutar organizacija. Nove digitalne tehnologije i evolucija interneta upućuju nas da ispitamo kako vladajuće organizacione teorije mogu biti unapređene i promenjene u skladu sa novim tehnološkim okruženjem. Ovaj rad pokazuje kako dosadašnji pristupi organizacionoj teoriji, posebno menadžerizam kao preovlađujući pristup, nisu uvek funkcionalni i ne kooptiraju sa aktuelnim organizacionim praksama, posebno na Internetu.

Keywords: teorija organizacije, menadžment, blokčejn, pametni ugovor, DAO, veštačka inteligencija.

Uvod

Ako krenemo sa proučavanjem istorije teorija organizacije, postajemo iznenađeni velikim brojem različitih perspektiva koje teoretičari usvajaju i koriste da bi razumeli organizacije. Uprkos različitim pristupima (pozitivizam, modernizam, postmodernizam, interpretivizam i tako dalje), menadžerizam je postao dominantan organizacioni diskurs, sa menadžmentom koji dobija status univerzalne prakse i sa menadžerima kao specijalistima za kontrolu i lokusom organizacionog znanja i mudrosti. Jedno pitanje koje se ovde nameće jeste zašto se ovo veličanje hijerarhije dogodilo na račun alternativnih načina organizovanja? Teorija organizacije ovo pitanje retko postavlja, uglavnom težeći da nekritički pretpostavi da je status quo i dalje neophodan i prirodan. Čini se da ovakav pristup nema alternativu i da je teorija organizacije uporno fokusirana na probleme menadžmenta, bez obzira na sve češće i opravdane dileme u pogledu njihovog stvarnog postignuća i doprinosa organizaciji.

Tradicionalni pristupi teoriji organizacije i pojava digitalnih platformi

Dok su u popularnim teorijama organizacije, održavanje hijerarhije i menadžerskih prerogativa uzimani kao prirodne, ekonomski neophodne organizacione karakteristike, menadžeri su delovali tako da ovekoveče i povećaju sopstvenu moć, status i nagrade. Sa institucionalizacijom teorije organizacije kao zasebne discipline, program poslovnih škola nisu kritički razmatrali uticaj menadžera na organizaciju i društvo u smislu raspodele moći, nagrada i statusa. Umesto toga, programi poslovnih škola fokusirali su se na demonstraciju profesionalne važnosti menadžera.

Većina pristupa definisanju organizacije može se svesti na jednu osnovnu, prema kojoj je „organizacija racionalna koordinacija aktivnosti većeg broja ljudi za postizanje neke zajedničke eksplicitne svrhe ili organizacionog cilja, kroz podelu rada ili funkcija i hijerarhiju autoriteta i odgovornosti” (Mc Aulei and all, 2007).

Iako je očigledno reći da organizacije uređuju većinu aspekata onoga što radimo i kako

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to radimo, to takođe otvara pitanja ko odlučuje šta treba da se radi i kako treba da se radi, i postavlja pitanja o efektima nekih od ovih društvenih procesa na ljude. Činjenica je da u većini organizacija nije moguće pretpostaviti postojanje konsenzusa. Zaista, različiti članovi mogu imati niz različitih ciljeva u vezi sa svojim angažovanjem u određenoj organizaciji. Ovi različiti ciljevi odražavaju posebne interese i potrebe različitih ljudi, ciljeve koji mogu biti u sukobu jedni sa drugima (Mc Aulei and all, 2007). Dakle, možda pojmovi kao što je „organizacioni cilj“ stvaraju moderan mit koji zamagluje važnu činjenicu, da organizacije nisu konsenzusne ili barem da ne treba polaziti od pretpostavke da su uvek konsenzualne.

Na primer, kritička teorija odbacuje teoriju organizacije orijentisanu na menadžment kao pogrešno shvaćenu i neetičku, jer se bavi samo problemima male manjine ljudi u organizacijama i stoga je inherentno nedemokratska. Umesto toga, teorija organizacije bi se morala više baviti relativno obespravljenom većinom članova organizacije kako bi unapredila njihova demokratska prava i odgovornosti. Da, teorija to može da učini, ali iskustvo hijerarhije i autoriteta u praksi organizacija to negira svakodnevno. Izjava da je organizacija orijentisana ka organizacionim ciljevima, često ne znači ništa više nego da su to ciljevi njenih top menadžera. To je zato što su načini na koje su koncepti „organizacija“ i „cilj“ osmišljeni i korišćeni, doveli do toga da organizacione pojave vidimo kao da su one uvek konsenzualni ili jedinstveni entiteti u kojima se uvek dele interesi i aspiracije članova.

Pojava Web 2.0 omogućila je platformizaciju ekonomije. Ekonomija platforme i digitalne platforme kao organizacioni oblici se sve više integrišu u društvene i ekonomske aktivnosti, pa su pitanja upravljanja platformom od suštinskog značaja za njeno uspešno funkcionisanje i održivost. Digitalne platforme često zahtevaju doprinose različitih aktera sa različitim perspektivama i ciljevima (vlasnici, programeri, korisnici) sličnim kao u tradicionalnim organizacijama. Dok je većina digitalnih platformi nastalih na Web 2.0 imala slične centralizovane strukture upravljanja, uspon decentralizovanih blockchain platformi zasnovanih na Web 3.0 stvorio je jedinstvenu priliku za implementaciju alternativnih struktura upravljanja. Web 3.0 na blokčejnu je distribuiran na ogromnom broju kompjutera, ponašajući se kao decentralizovana platforma oslobođena od bilo kog oblika cenzure, nadzora i pritisaka (Brekke, 2019). Čak i u okviru postojećih centralizovanih i hijerarhijskih struktura upravljanja, Blockchain se takođe može koristiti kao alat za uspostavljanje transparentnijih i participativnijih struktura upravljanja i izgradnju infrastrukture za distribuirano upravljanje i decentralizovanu saradnju, kako bi doprinosi i nagrade u digitalnoj privredi bili ravnomernije raspoređeni. Sa blokčejn interfejsom prilagođenim korisniku, investitori mogu lakše da razumeju i prate odluke odbora u realnom vremenu (posebno kada se radi o nadoknadi generalnog direktora i top menadžmenta), kao i da omogućiti akcionarima da donose odluke na osnovu boljeg informisanja, drže korporativne rukovodioce odgovornim i menadžere više fokusirane na blagostanje akcionara i ne samo na njihove bonuse. Dakle, šta je blokčejn i kako može uticati na teoriju organizacije.

Blockchain kao tehnologija distribuirane knjige (DLT)

Blockchain je vrsta otvorene „tehnologije distribuirane knjige“ koja može automatski da evidentira transakcije između dve strane na efikasan i proverljiv način, kroz zajednički dogovor. Takođe je izazvao interesovanje i široku pažnju programera softvera, startapa, korporacija, vlada i međunarodne zajednice koji dele zajedničku težnju da uspostave decentralizovanu organizaciju bez centralne vlasti. Blockchain je zasnovan na kriptografskim algoritmima distribuiranim preko peer-to-peer mreže, koji omogućavaju širokom spektru ljudi da zabeleže svoje ugovore o određenim transakcijama na bezbedan i proverljiv način (Brekke, 2019). Blockchain je sposoban da skladišti sve vrste informacija, kao što su kreditne kartice, medicinska i finansijska evidencija, identitet osobe, biračke spiskove, zemljišne knjige, istoriju isporuke proizvoda ili čak digitalna sredstva. Knjiga duplira transakcije istovremeno kroz niz nepovezanih računara ili servera koji se nazivaju „čvorovi“, tako da se isti podaci anonimno snimaju u mreži računara. Svaki blok se dodaje i povezuje sa prethodnim blokom putem kriptografije, tako da, kad god čvorovi unutar mreže postignu konsenzus, grupa blokova ili transakcija u tom lancu se validira – stoga se tehnologija naziva Blockchain ili lanac blokova.

Da bi blok bio siguran, on treba da sadrži četiri informacije:

- 'heš', digitalni otisak prethodnog blok;¹
- rezime aktuelne transakcije;
- vremensku oznaku;
- dokaz da je blok 'ispravan' rešavanjem veoma složenog algoritma.

Bitcoin je najšire prihvaćen blockchain zato što su korisnici, koderi, rudari i čvorovi adekvatno ekonomski nagrađeni za interakciju sa Bitcoin-om, i to je ono što ga održava od njegovog nastanka 2009. godine kada je autor pod pseudonimom Satoši Nakamoto u hakersku zajednicu pustio svoju Belu knjigu (White Paper)². Bitcoin se takođe može shvatiti kao spontano nastajuća, decentralizovana i autonomna organizacija koja pruža istovremeno, novi oblik novca i novu uslugu plaćanja (Ammous, 2018). U ovoj organizaciji ne postoji upravljačka ili korporativna struktura jer su sve odluke automatizovane i unapred programirane. Dobrovoljni koderi u projektu otvorenog koda mogu predložiti promene i poboljšanja koda, ali na korisnicima je da izaberu da li će ih usvojiti ili ne. Rudari ulažu struju i procesorsku snagu u rudarsku infrastrukturu koja štiti mrežu jer su za to nagrađeni. Korisnici Bitkoina plaćaju naknade za transakcije i kupuju novčiće od rudara jer žele da iskoriste digitalnu gotovinu i imaju koristi od apresijacije kriptovalute tokom vremena, a u tom procesu ujedno finansiraju ulaganje rudara u rad mreže (Ammous, 2018). Ulaganje u hardver za rudarenje PoW (proof of work)³ čini mrežu sigurnijom i može se shvatiti kao kapital firme. Što više raste potražnja za kompanijom, to su vrednije nagrade rudara i naknade za transakcije, što zahteva više procesorske snage za generisanje novih novčića, povećavajući time kapital kompanije. To je otvoreni ekonomski i društveni aranžman koji je produktivan i unosan za sve uključene, što zauzvrat dovodi do toga da kompanija nastavlja da raste zapanjujućim tempom. (Ammous, 2018). Ovaj koncept se takođe naziva blokčejn 1.0.

Ethereum blockchain, ili blockchain 2.0. je potpuno revolucionisao koncept decentralizacije. Lansiran 2014. godine, Ethereum blockchain je proširio mogućnost transakcija na sve vrste vrednosti, a ne samo na monetarne transakcije. Doprinos Ethereum blockchaina je:

- Koncept pametnih ugovora
- VEB3.0, nova faza u evoluciji Interneta
- Decentralizovane autonomne organizacije (DAO)
- ERC standardi za kreiranje tokena

Strukturiranjem ovlašćenja za donošenje odluka i kontrolnih prava putem pametnih ugovora koji se samostalno izvršavaju na blokčejnu, efikasno upravljanje platformom može pomoći u harmonizaciji podsticaja, koordinaciji akcija, ublažavanju sukoba i negovanju zajedničkog identiteta. Blockchain na taj način omogućava kompatibilnost podsticaja za sve zainteresovane strane, efikasnost i funkcionalnost platforme. DAO (Decentralized Autonomous Organizations) kao nova organizaciona forma funkcioniše kroz pravila kodirana kao kompjuterski programi, odnosno pametne ugovore na blok-čejnovima, na primer Ethereumovom. Na osnovu ovih pravila odvijaju se aktivnosti u korist svih akcionara. DAO je kompjuterski algoritam koji primenjuje prava vlasništva nad kapitalom, ugovorne obaveze i pravila poslovne logike (Rijmenam, van M. 2020). Vlasnici tokena akumuliraju moć i kapital osnivanjem različitih tipova organizacija sopstvenim novcem i na taj način imaju stvarnu moć donošenja odluka, što bi konačno eliminisalo odvajanje vlasničkih od upravljačkih funkcija, jedno od osnovnih „tekovina“ menadžerizma kao dominantne paradigme u teoriji organizacije. Na prvi pogled deluje kontradiktorno, ali u preovlađujućoj kapitalističkoj paradigmi, blokčejn kao tehnološko rešenje nam omogućava da na prirodan i logičan način uspostavimo konsenzus koji se u dosadašnjoj praksi upravljanja nije mogao ostvariti. Dole menadžeri, živeo menadžment (Tappscot, 2016)!

¹ Kriptografski heš je sažetak ili digitalni otisak određene količine podataka. U kriptografskim heš funkcijama, transakcije se uzimaju kao ulaz i prolaze kroz algoritam heširanja koji daje izlaz fiksne veličine.

² Nakamoto, Satoshi, 2008. Bitcoin: A Peer-to-Peer Electronic Cash System

³ Kriptografski dokaz je sposobnost da se nešto dokaže sa matematičkom sigurnošću. To je ono što u beloj knjizi (Bitcoin White paper) Satoši Nakamoto podrazumeva pod elektronskim sistemom zasnovanim na „kriptografskom dokazu umesto poverenju. Integritet podataka se proverava matematičkom verovatnoćom, a ne verovanjem autoritetu ili nečijoj reči. Dodajte vremensku oznaku i može se dokazati kada je dati zapis napravljen. Heširajte ih zajedno u „lanac“ ili „stablo“ pozivajući se na heš izlaz prethodnog zapisa, i imate linearnu istoriju dokazano sigurnih zapisa, novi blok u lancu” (Nakamoto, 2008).

Ekonomija korisnika i DAO kao novi društveni i ekonomski ekosistem

Digitalne platforme su digitalni sistemi koji olakšavaju komunikaciju, interakciju i inovacije za podršku ekonomskim transakcijama i društvenim aktivnostima. Oni imaju potencijal da unaprede naše društvene živote i promene prioritete koji se ogledaju u sistemu vrednosti. Upravljanje platformom se fokusira na strukturiranje ovlašćenja za donošenje odluka i kontrolnih prava kako bi se obezbedilo efektivno stvaranje vrednosti i fer distribucija vrednosti. Ključni aspekt upravljanja je stepen decentralizacije i konsenzusa koji se odnosi na stepen u kojem se prava i kontrola dele između svih zainteresovanih strana.

Korišćenjem ICO (Inicijalne ponude kovanica) kapital postaje vlasništvo zaposlenih. Zaposleni mogu da akumuliraju moć i kapital osnivanjem organizacija sa sopstvenim novcem i na taj način imaju stvarnu moć donošenja odluka. Inicijalne ponude kovanica- initial coin offer (ICO) obično koriste blokčejn tehnologiju da ponude takozvane „tokene“ koji mogu da daju različita prava svojim vlasnicima. Očigledno je da kompanija koja javno izdaje kripto žetone na mreži u zamenu za fiat ili kripto sredstva jako liči na inicijalnu javnu ponudu-initial public offer (IPO), u kojoj kompanija nudi hartije od vrednosti javnosti na berzi. Za razliku od inicijalne javne ponude (IPO)⁴, ICO se obično dešava u vrlo ranim fazama projekta, a sredstva prikupljena kroz ICO se obično koriste za podršku ranom razvoju projekta (startapi).

Za razliku od valuta i kriptovaluta koje predstavljaju vrednost, tokeni daju svom vlasniku posebna prava u odnosu na izdavaoca ili beleže vlasništvo nad imovinom. Šifrovanje ovih prava na blok lancu naziva se „tokenizacija“. Da biste kreirali tokene, nije potrebno kreirati blok lanac od početka. Umesto toga, neki postojeći blok lanci, kao što su Ethereum ili LimeChain, pružaju šablone koji omogućavaju izdavaocu da kreira sopstvene tokene. Ethereum blockchain koristi ERC (Ethereum Request for Comment) standarde. Ethereum Request for Comments (ERC) su standardi za kreiranje različitih tipova tokena, koji omogućavaju aplikacijama i pametnim ugovorima da komuniciraju sa njima na unapred određene ili unapred planirane načine (Ali, Bagui, 2021). Tokeni koji su zasnovani na sopstvenom blokčejnu nazivaju se „kovanicama“ (Bitcoin, Ether, Cardano, KSRP, TRON itd.). Razlika između takvih novčića i tokena koji koriste drugi blok lanac nije relevantna jer oba mogu postati zamenljiva i likvidna sredstva. Postoje tri kategorije tokena na osnovu njegove funkcionalnosti: tokeni valute, tokeni za pomoć i investicioni tokeni. Čim izdavalac završi kreiranje tokena, tokeni se mogu oglašavati i prodavati. Svaki izdavalac tokena nudi određenu vrednost internet zajednicama. Uobičajena je tržišna praksa da emitent na svojoj web stranici objavljuje takozvanu „belu knjigu“. Korišćenjem pametnih ugovora, investitor može da razmeni kriptovalute uskladištene u njegovom kripto novčaniku za nove tokene. Reklamna kampanja se prvenstveno oslanja na kanale društvenih medija kao što je Twitter. Kriptovalute dozvoljavaju mikro plaćanja kao neophodan preduslov za IoT (internet of Things). Trenutno, osnovni problem sa regulacijom tokena je to što se tokeni nude putem interneta i stoga su operabilni širom sveta. Nasuprot tome, regulisanje, nadzor i sprovođenje finansijskih tržišta i dalje su podložni nacionalnim zakonima. Velika prepreka su razlike u ključnim definicijama za primenu zakona o hartijama od vrednosti. Na primer, američki zakon se odnosi na „investicioni ugovor“, dok se EU zakon fokusira na „prenosive hartije od vrednosti“.

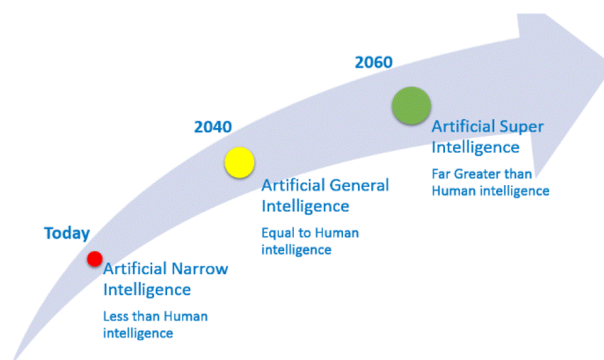
Za razliku od donošenja odluka odozgo nadole koje koriste tradicionalne centralizovane organizacije, donošenje odluka u DAO je dizajnirano kao demokratski proces u kome članovi glasaju da bi se složili o izvršenju toka akcije koji se dešava automatski, na decentralizovan način. U poređenju sa klasičnim modelima organizacije, DAO imaju nekoliko konkurentskih prednosti. DAO nema krutu hijerarhijsku strukturu jer svaki učesnik ima određeni iznos glasačke moći proporcionalan iznosu koji je uložio. Ovakav izbor dizajna omogućava bolji stepen saradnje među članovima, što stvara plodno okruženje za inovacije, jer pametne ideje dobijaju priznanja koja zaslužuju i nisu podvrgnute suprotstavljenim interesima korporativnog aparata. U DAO, svaka ideja ima koristi od vidljivosti i njena šansa da bude izglasana i prihvaćena, u potpunosti zavisi od vrednosti koju može doneti organizaciji i svim njenim članovima. Zbog toga mnoge pristalice DAO-a tvrde da ova vrsta organizacije predstavlja novi korak u evoluciji poslovnih organizacija. DAO se može pozicionirati na konvergenciji nekoliko inovativnih tehnologija kao što su AI i blockchain, dajući im mogućnost da pokrenu širok spektar poslovnih mogućnosti kroz svoju sposobnost da deluju kao decentralizovani otvoreni ekosistemi (permissionless).

⁴ IPO se obično dešavaju u mnogo kasnijim fazama veoma uspešnih poduhvata i stoga se mogu smatrati pokazateljem uspeha.

Tako svaka DAO platforma sa održivom ekonomijom korisnika postaje nezavisan ekosistem sa različitim ciljevima, poslovnim idejama, vrednostima. Svaka DAO platforma može usvojiti različit nivo decentralizacije kako bi osigurala efikasnost i održivost. DAO ekosistem kao novi organizacioni i društveni oblik je sposoban da zauzme mesto u novom globalnom virtuelnom prostoru – Metaversu. To je kolektivni 3D virtuelni svet gde korisnici mogu da učestvuju u različitim aktivnostima preko svojih digitalnih avatara, koristeći NFT (Non Fungible Token), nerazmenljive tokene.⁵ Upotreba AR (Augmented Reality) i VR (Virtual Reality) tehnologija može podržati stvaranje impresivnih svetova u kojima korisnici mogu da se bave stvarnim sadržajem. Metaverse kao digitalno okruženje koje funkcioniše na blokčejnu pruža neograničenu društvenu interakciju i poslovne mogućnosti. Blockchain je fundamentalan za rad u Metaverse-u, digitalna sredstva poput tokena će definisati vlasništvo nad Metaverse-om, a kriptovalute bi mogle pokrenuti novu digitalnu ekonomiju.

DAO i veštačka inteligencija – sledeći korak ka novom svetu

Decentralizovana autonomna organizacija (DAO) je organizacija koja se vodi kroz pravila kodirana kao kompjuterski programi koji se nazivaju pametni ugovori. Glavni cilj DAO-a je da stvori organizaciju koja može da funkcioniše bez ljudskog hijerarhijskog upravljanja. U teoriji, svaka interakcija između ljudi i organizacija može se izraziti kao ugovor (Rijmenam, van M. 2020). Pametni ugovori (prenos informacija i sprovođenje ugovora) izgrađeni na Blockchain tehnologiji nam omogućavaju da izgradimo ovakve organizacije zasnovane na oblaku (cloud). Cilj je da se automatizuju sve upravljačke i administrativne funkcije. AI aspekt AI DAO je povezan sa nezavisnim agentima koji samostalno donose odluke. AI DAO predstavljaju ne samo tehnološku revoluciju već bi mogao da kreira i prodaje sopstvene proizvode i usluge koristeći AI agente, dok bi profit išao stvarnim ljudskim bićima. U budućnosti, AI DAO mogu igrati značajnu ulogu u konceptu implementacije univerzalnog prihoda (universal basic income) koji se sve češće spominje kao rešenje za problem koje donosi digitalna tranzicija. Idealno rešenje je ono u kome bi veštačka inteligencija mogla da traži različite parametre i donese najbolje moguće odluke i za zaposlene i za akcionare. Danas je to nemoguće u potpunosti postići jer još nismo uspeli da stvorimo veštačku opštu inteligenciju (AGI), iako se AI već uveliko koristi u berzanskim transakcijama⁶. Veštačka opšta inteligencija je mašina koja je sposobna da razume svet kao i svaki čovek, i sa istim kapacitetom da nauči kako da izvrši ogroman niz zadataka. Veštačka super inteligencija (ASI) će razumeti svet bolje od ljudi – neće biti potrebe za konsenzusom.



Slika 1. Projektovana evolucija AI⁷

⁵ Osnovna karakteristika NFT-a je jedinstvenost, što znači da se ne mogu razmenjivati sa drugim tokenima, i to ga čini najprikladnijim načinom da se sa njime identifikuje nešto što je unikatno i predstavlja osnov za stvaranje veštačke digitalne oskudice. Jedinstvenost je zagarantovana NFT-ovima jer postoji samo jedan token koji ima neku specifičnu karakteristiku i potpuno se razlikuje od bilo kojeg drugog NFT-a koji je prisutan na tržištu. Štaviše, postoji samo jedan zvanični vlasnik a vlasništvo je obezbeđeno Ethereum blokčejnom, što garantuje da niko ne može da izmeni evidenciju o vlasništvu ili da kopira isti takav token.

⁶ Aladdin (Asset, Liability and Debt and Derivative Investment Network), superkompjuter koji koristi Black Rock, inc za precenu berzanskih transakcija u vrednosti od 26,6 triliona dolara, za 2020. Godinu.

⁷ Ziyad Mohammed (2019). Artificial intelligence: definition, etics and standards, The British University in Egipt.

Danas, AI inteligentni agenti mogu naučiti ili koristiti znanje za postizanje nekih specifičnih ciljeva. Oni mogu biti veoma jednostavni ili veoma složeni. Većina aktuelnih AI rešenja nam pomaže u procesu donošenja odluka, i sve više uče iz svojih postupaka kako bi optimizovali i unapredili odluke koje su sami doneli. AI DAO može da transformiše koncept DAO kako bi ostvario svoju misiju, kako bi omogućio svima da doprinesu razvoju veštačke inteligencije pod bliskim ljudskim nadzorom. Čovek mora da stoji iza svake veštačke inteligencije. Pitanje je da li želimo AI kao monopolizovanu, razvijenu iza „gvozdene zavese“ korporativnih giganta kao što su Alphabet, Facebook, Amazon, Nvidia, Microsoft, kao glavnih aktera u polju razvoja veštačke inteligencije, ili želimo da u evoluciji AI učestvuje širok spektar zainteresovanih strana na transparentan način, gde svako može preuzeti aktivnu ulogu i verifikovati AI budućnosti kao etički i ljudski orijentisanu (Bjelajac, Ž., Bajac, M. 2022). Ljudi moraju biti direktno uključeni u oblikovanje budućnosti veštačke inteligencije, umesto da budu pasivni posmatrači koji dozvoljavaju da velike kompanije prikupljaju njihove lične podatke kako bi razvile i obučavale veštačku inteligenciju na beskrupulozan i netransparentan način.

Tradicionalne organizacije	AI decentralizovane autonomne organizacije
Upravljanje Hijerarhijsko upravljanje od gore prema dole; previse informacija i uskih grla u komunikaciji Poverenje Bazirano na iskustvu i prošlim odnosima Odlučivanje Bazirano na ekspertizama i hijerarhiji Operativni troškovi Visoki	Upravljanje Ugrađeno u kod- pametni ugovori Poverenje Bazirano na kriptografiji i blokčejnu Odlučivanje Automatizovano zahvaljujući veštačkoj inteligenciji i pametnim ugovorima Operativni troškovi Niski

Tabela 1. Razlika između tradicionalne i decentralizovane AI organizacije

Iako se danas možda čini kao daleka budućnost, brzi razvoj kvantnog računarstva će ubrzati razvoj veštačke inteligencije brže nego što možemo da zamislimo. Za razliku od klasičnog bita, koji može biti samo u stanju koje odgovara jedinici ili nuli (0 ili 1) u električnom kolu, kubit može biti u superpoziciji oba stanja, ili čak u beskonačnom broju stanja istovremeno, što otvara neograničene mogućnosti za računarsku snagu. Kvantni računari mogu da rešavaju probleme mnogo brže od klasičnih računara jer mogu isprobati nekoliko rešenja istovremeno. Takođe nisu sputani istim ograničenjima kao klasični računari, što znači da mogu da reše trenutno nemoguće probleme. Ovo čini kvantno računarstvo savršenim kandidatom za napajanje veštačke inteligencije. Ogromne količine podataka koje obrađuju AI sistemi i big data, zahtevaju ogromnu računarsku snagu. Kvantni računari imaju potencijal da obezbede tu moć i tako omogućе veštačkoj inteligenciji da dostigne svoj puni potencijal.

Zaključak

Poslednjih nekoliko godina svedoci smo dramatične tehnološke transformacije u svetu koja utiče na društvo u kome živimo i načine na koje organizujemo svoje živote. Lider Svetskog ekonomskog foruma Klaus Šwab najavio je predstojeću Četvrtu industrijsku revoluciju koja će spojiti fizičko, digitalno i biološko u jedno. Za njega je COVID 19 jedinstvena prilika da promeni svet na bolji način. Nećete imati ništa i bićete srećni. Deljenje će biti standard, posredovanje luksuz. Princ Čarls ovu novu fazu svetske tranzicije naziva inkluzivnim kapitalizmom.

Skoro svako poslovanje u blokčejn i kripto industriji teži masovnom usvajanju na ovaj ili onaj način. Danas ima preko 300 miliona kripto korisnika, 70 miliona korisnika digitalnih novčanika, a Internet je doživeo poplavu novih korisnika iz celog sveta koji teže da budu deo ove najveće inovacije čovečanstva. Budućnost je neizvesna kao i uvek, ali svet budućnosti mora biti decentralizovan. Decentralizacija mora postati ideja vodilja milenijumske tranzicije post-demokratskog sveta ka raspodeli moći na mnogo veći broj društvenih aktera nego što je to

bila do sada. Decentralizovani internet i nove tehnologije pružiće bezbroj organizacionih oblika i mogućnosti svakom čoveku da odabere način na koji će se uključiti u globalnu kolaborativnu ekonomiju.

A šta je sa teorijom organizacije?

U istoriji čovečanstva, značajna tehnološka otkrića i inovacije uvek su prethodili društvenim promenama. Snaga pare i struje, tokom prve i druge industrijske revolucije uvela je čovečanstvo u moderno doba. Krajem devetnaestog veka i početkom druge industrijske revolucije, F.V.Taylor je uspostavio naučni menadžment. Tokom 1980-ih, migracijom organizacionih istraživača sa socioloških odeljenja u poslovne škole, teorija organizacije je postala posebna naučna disciplina. Međutim, kada govorimo o organizaciji, teoriji organizacije i teoretičarima organizacije, postavlja se važno pitanje. Da li menadžeri zaista čitaju naučne radove i zatim pokušavaju da sprovedu ove "recepte" u nadi da će obezbediti konkurentsku prednost, ili ako ne čitaju, zašto je tako. Možda teorijska istraživanja rezultiraju očigledno trivijalnim nalazima sa stanovišta menadžera praktičara? Ili možda jednostavno više nisu relevantni? Jedna činjenica je nepobitna: danas istraživanje teorije organizacije mnogo zaostaje za praksom menadžmenta.

Naučna zajednica, što je pre moguće, mora ozbiljno da shvati način na koji ove disruptivne tehnologije menjaju društveno okruženje i teorijski unapređuju postojeće, i podstiču novu kreativnu primenu ovih tehnologija, koje u praksi već potvrđuju svoje transformativne i emancipatorske potencijale. Teoretičari organizacije treba da promene svoju orijentaciju sa referentnog menadžerskog okvira ka ljudima i zajednici. U budućnosti će tehnologija sve više definisati organizacione forme i menadžment, a ne teoretičari menadžmenta.

I konačno, zašto organizaciona teorija i teoretičar nisu funkcionalni i ne kooptiraju sa aktuelnom organizacionom praksom? Navešćemo samo neke od razloga:

- Zbog nerazumevanja novih tehnologija
- Zbog visoke stope inovacija u IT sektoru
- Zbog nedostatka uvažavanja kreativnih rešenja unutar internet zajednice
- Zbog nedostatka državne regulacije interneta i novih tehnoloških rešenja
- Zbog zahteva i pravila recenziranih časopisa, koji pre favorizuju validaciju i metodološku

strogost nego korisnost predloženih rešenja.

Nasuprot tome, postoji veliki optimizam internet zajednice u pogledu mogućnosti novih disruptivnih tehnologija da omoguće pravednije i humanije društvo. Džozef Lubin, suosnivač jedne od najvećih DAO platformi, ConsenSis, kaže: „Postalo mi je jasno da umesto da gubimo vreme šetajući ulicama sa transparentima, možemo svi zajedno da radimo na izgradnji novih rešenja za ovu posrnuću ekonomiju i društvo. Ne zauzimajte Volstrit, izmislite vašu sopstvenu ulicu (Tappscot, 2016).”⁸

Conflict of interests

We have no known conflict of interest to disclose

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DOES SMART HOME HAVE WIDE OPEN DOORS? MQTT COMMUNICATION PROTOCOL STANDARDIZATION - POTENTIAL MISSING RING OF THE IOT NETWORKS SECURITY CHAIN

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Abstract: This paper pointed out the benefits as well as the security risk that is the result of inconsistencies of software applications from different manufacturers and the lack of standards in IoT devices networks. Message Queue Telemetry Transport (MQTT) is now one of the most used open protocols in the Internet of Things. The term IoT is often followed by a great enthusiasm of researchers. End-users also share the same sentiment, ignoring the security risks that arise from dropping and reconnecting IoT devices that very often send passwords to server in plain text, while manufacturers often remain silently indifferent. They primary put focus on profitability, but not on safety. In other words, the door on smart homes remains wide open for hackers. This paper gives an overview of one potential solution of the Internet of Things security problem.

Keywords: *Internet of Things, MQTT Communication Protocol, Security Risks, Standardization.*

LOOK TO THE FUTURE OF IOT AND BEYOND

Web 3.0 is projected to become a new internet paradigm, an extension and extension for Web 2.0. To this day, there is still a lot of debate about the existence of Web 3.0. Many claim that we have already entered this era, while others disagree and argue that there is still a long way to go.

Web 3.0 is based on the following basis:

- Portability and ubiquity (anywhere, anytime, every device will be connected to the network, meaning content will be available everywhere)
- Personal (focused on the individual, as opposed to the community)
- Dynamic and contextual content
- Artificial intelligence (focuses on natural language processing that computers will understand better than human language and thus ensure that relevant results are obtained faster)
- 3D graphics (three-dimensional design will be used on websites to provide users with a clear picture of products and services)

The semantic web and artificial intelligence are the two cornerstones of web 3.0. Their synergy creates web knowledge characterized by defined meaning, meaning generation, sharing and linking content through search and analysis. Thanks to semantic metadata, Web 3.0 will help to increase the connectivity of all available data. As a result, the user experience will develop at another level of connectivity that uses all available information. Web 3.0 can also be called the web of everything and everywhere, because most of the things around you are connected to the Internet called the Internet of Things. In any case, we are slowly or surely reaching a level where all the things we use will certainly be available online and connected via the Internet. This idea has been around for decades, it has been in the works for a long time in a way and is called the Internet of Things.

IOT & USE CASES

Since there is still no unambiguous definition of the term Web 3.0, we are simultaneously moving alongside its development and beyond its framework towards the Internet of Things. IoT is likely to be the next stage of network development because it seems that one of the

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features of the web we are heading towards and that is ubiquity, Brings IoT to a whole new level. Smart devices in the Internet of Things not only use the Internet, but also communicate with each other through machine-to-machine (M2M) communication to accomplish tasks without the need for people to interfere. Today, there are already many smart devices as well as fully automated internet-connected systems that work without human interference. The Internet is an extension of the network to the physical devices that we use every day. Embedded in the electronics of objects and things, with internet connectivity and the existence of certain sensors these devices can communicate with each other and transmit information to others via the Internet, and can be monitored and controlled remotely. The definition of IoT has evolved due to the synthesis of multiple different technologies, real-time analytics, machine learning, sensor development and embedded systems. The advancement of technologies in the field of development of wireless sensors, control systems, automation, integration of artificial neural networks has greatly contributed to the development of IoT. For the consumer market and most people, IoT technology is synonymous with products related to the concept of smart homes, which includes devices such as lighting, thermostats, home security systems and cameras and other small household appliances that support one or more common ecosystems and can be controlled via devices connected to that ecosystem, such as smartphones or smart speakers. The most significant trend in the Field of IoT is the explosive growth of internet-connected devices that can be controlled via the Internet. A very wide range of device management applications means that there are many ways in which certain devices can be controlled but a number of common features are slowly becoming standardized, further facilitating the expansion of IoT. Also, IoT creates opportunities for more direct integration of the physical world into computer systems, resulting in improved efficiency, economic growth and reduced human effort.

Since IoT is most often associated with smart homes, in terms of application it certainly finds its use there. Smart home IoT uses devices that connect a variety of sensors and combine the characteristics of multiple devices that are connected via IoT to make them available for remote monitoring, control, access, or to provide information and services that meet the needs of users. The first modern products for smart homes became available to consumers in the early 2000s. Smart home technology allows users to control and monitor their devices using apps on computers or phones as well as on any device that is connected. Users can remotely control all connected devices whether they are in or out of the house. This allows for far more efficient energy consumption as well as securing facilities. The technology used individually in homes is now used to make smart cities that function in a similar way to smart homes with the idea of monitoring everything much more efficiently and to save energy and reduce maintenance costs. One of the key features of smart home deployment is providing assistance to people with disabilities and the elderly. These systems use assistive technologies that adapt to the specific disability of the owner. Voice control helps people with limited vision and mobility while warning systems can be connected directly to appliances used by people with hearing impairments. Also, these characteristics can additionally include sensors that track medical emergencies such as attacks or falls. Smart home technology applied in this way gives its users more freedom and raises the quality of life.

The Internet of Medical Things is the application of IoT for medical and health purposes, data collection and analysis. Smart healthcare, as it is called, has led to the creation of a digitized health care system by linking available medical resources and health services. IoT devices can be used for the purpose of remote monitoring of the patient's health and a system that notifies health services in case of danger to the patient. Devices that allow health monitoring can be simple from monitors that monitor the heart, to devices that monitor specially installed implants such as pacemakers or advanced hearing aids. Some hospitals have even begun implementing the idea of "smart beds" that inform them in case patients try to get up without permission, and are also used for the purpose of adjusting beds in a certain way without physical interaction from medical personnel. As of 2018, the Internet of Medical Things has not only been applied in clinical trials but also in the wider health and health insurance industry. The IoT now allows doctors, patients and other individuals with access to be part of a system where patient records are stored in a database with constant access to the necessary patient information. Internet of Things systems are patient-centered. This also includes some flexibility in relation to current health conditions. IoT has also found application in health insurance - with the help of solutions based on bio-sensors and smart clothing that monitor user behavior, it is possible to process data more accurately and develop new pricing models for health insurance and services individually

and personalized for each user.

IoT can help integrate communication, control and information processing among different transport systems. Dynamic interaction among components of the transport system enables internal and external communication, smart traffic control, smart parking, electronic toll collection system, logistics, fleet management, vehicle correctness control, vehicle safety and roadside assistance. Sensors such as GPS sensors, air humidity and temperature sensors send data to the IoT platform then the data is analyzed and sent back to users. This way, users can monitor the condition of the vehicle in real time and make appropriate decisions. If this information is combined with machine learning, over time it can lead to and help reduce the number of traffic accidents in a number of ways, such as introducing warnings about sleepy drivers, critical road sections and possibly providing enough information for vehicles that will be autonomous on the roads.

IoT devices can be used to monitor and control mechanical, electrical and electronic systems used in various types of buildings e.g., public and private, industrial, institutions or residential, as well as in home automation and building automation systems. In this context, three main areas are dealt with in the literature:

- Integrating the Internet with energy management systems in buildings to create “smart buildings” energy efficient and managed via the Internet of Things,
- Possible real-time tracking methods to reduce energy consumption and track passenger behavior
- Integration of smart devices in the built environment and how they can know how they can be used autonomously in future applications

Monitoring and controlling the operations of urban and rural infrastructure such as bridges, railways and wind farms are one of the key applications of the Internet of Things. IoT infrastructure can be used to monitor all events or changes in structural conditions of infrastructure that may endanger safety and increase the risk of possible injuries and the like. IoT can benefit the construction industry by saving costs, reducing time, better quality workdays, paperless workflow and increasing productivity.[4] This can help make faster decisions and save money using real-time data analytics. It can also be used to plan repair and maintenance activities in an efficient way, by coordinating tasks between the various service providers and users of these facilities. IoT devices can also be used to control critical infrastructure such as bridges to provide access to ships. The use of IoT devices for monitoring and operational infrastructure is likely to improve incident management and emergency response coordination, as well as the quality of service, and thus reduce labor costs in all infrastructure areas. Even areas such as waste management can benefit from the automation and optimization brought about by the Internet of Things.

IoT can achieve seamless integration of various production machines equipped with sensor, identification, process, communication, driving and network capabilities. Based on such a highly integrated smart cyber physical space, it opens the door to creating new business and market opportunities for production. Network control and management of production equipment, asset management and production process situation or control bring IoT into the domain of industrial applications and smart manufacturing. Intelligent IoT systems enable fast production of new products, dynamic response to product requirements and optimization of production in real time as well as networks of supplier chains, by networking production machines, sensors and control systems together.

In agriculture, there are numerous Applications of IoT such as collecting data on temperature, precipitation, humidity, wind speed, pest infection, and soil content. This data can be used to automate agricultural techniques as well as make informed decisions to improve quality and quantity, minimize risks and waste, as well as reduce crop management efforts. For example, farmers can now monitor soil temperature and moisture from afar, and even apply internet of things data to precise fertilization programs that will help them improve production.

A significant number of power-consuming devices such as switches, sockets, light bulbs and TVs already have integrated internet connectivity. These devices allow remote user control or central control via a cloud-based interface, and enable functions such as planning e.g., remote power or turning off heating or cooling systems, stove control, changing lighting conditions, etc. This is only part of the ideas of using and applying use for IoT, in fact, IoT provides almost endless possibilities for connecting devices and equipment. In terms of creativity, this field is

wide open with an unlimited number of ways to network devices. IoT in addition to possibility carries with it potential security problems. Related to the privacy and security of the Internet of Things. [1]

IOT SECURITY AND MAIN PRIVACY ISSUES

As sensors and cameras become more common in everyday use, especially in public spaces, people have less and less knowledge of the information collected from them and have no way to avoid it. The potential that IoT has to invade privacy and cause security issues is worrying. Among the proposed solutions in terms of techniques that have applied and met the basic principles of privacy, only a few have shown satisfactory results. Despite the high security profiles and alarming flaws, device manufacturers remain indifferent. They focus on profitability, but not on safety. Consumers must have full control over the data collected, including the option to delete it if they choose to. Without ensuring privacy, spending in the “broad masses” simply won’t happen.

Many people are embarrassed that companies collect information about them, and they are even more embarrassed to sell this information to everyone. The user is forced to give up all privacy (often in conditions such intricate and long texts that no one bothers to open them) or the client simply cannot access the service unless he agrees. This has led to ongoing discussions about consumer privacy and how best to educate consumers about privacy and data availability.

Security is the biggest concern in adopting Internet of Things technology. In particular, as IoT spreads rapidly, cyberattacks are likely to become more and more physical and less of a virtual threat. The current IoT comes with a number of security flaws. These weaknesses include poor authentication (IoT devices are used with default credentials), unencrypted messages sent between devices, SQL injections, and a lack of verification or encryption of software improvements. This allows attackers to easily intercept data to collect personally identifiable information, steal user credentials when logging in, or incorporate malware into a newly updated firmware. It’s not a bad idea to wonder if IoT flaws will allow hackers to do whatever they want through interconnected devices and the vague and open question of who guarantees privacy and how to install security measures in new internet-connected devices. Mobile car owners can share the key remotely via the mobile app. In other words, it means nothing else that these same cars can be hijacked and stolen via their internet connections. Nevertheless, IoT enters its adolescence, as connected devices become smarter, more comprehensive and ubiquitous. Algorithms and data visualization schemes are also evolving. It is possible to test previous security flaws and previous cases of privacy breaches, thus providing more than necessary security for further widespread use of IoT in all areas. Security and risk management should not be taken lightly into account when creating new ways of using IoT, as new technologies come with new creative ways of misuse them.

MQTT STANDARDIZATION OF IOT – POTENTIAL SOLUTION

The suitability for reliable and efficient communication, even via unstable mobile networks and the networking of many thousands of devices, is required in many situations. This is why Message Queue Telemetry Transport (MQTT) is now one of the most important protocols in the Internet of Things. Since MQTT is mostly used in “machine to machine” and “Internet of Things” field, it is somewhat surprising that the history of the protocol begins as early as 1999. Since the mobile infrastructure at that time was disproportionate to the current expansion, there were significant challenges. One of them was data transmission via satellite and terrestrial networks with the lowest possible costs. A generic solution should also be found that goes beyond a direct point-to-point connection and decouples the sensors as data producers from the data users. [2]

PROTOCOL GOALS

To overcome the challenges, the following properties were developed for the protocol:

- The implementation must be simple in order to connect devices with limited resources.

- There must be different service qualities for data transmission so that transmission is also guaranteed in unstable networks.
- The transmission must simply and efficiently use the available bandwidth.
- Since meta information is often sent again when interrupted connections are resumed, it would be advantageous to store this on the server side (session awareness).
- The protocol should be able to transfer different data types and not be restricted to a specific structure (data-agnostic).

To achieve these goals, MQTT protocol was developed. In 2010, it was then officially released under open-source license and was brought as MQTT library under the umbrella of the Eclipse Foundation, further boosting the widespread use of the protocol. The goals identified technology for scalable real-time communication with minimal use of broadband and resources. Real-time means data transmission without polling or similar mechanisms. MQTT implements the publish/subscribe pattern. The paradigm shift from a request/response to an event-driven publish/subscribe architecture is the central aspect here. It replaces the point-to-point connections with a central server (broker) to which both data producers and users can connect. The sending (publishing) and receiving (subscribing) of messages works via so-called topics. A topic is a string that represents a kind of subject of the message, but is structured similarly to a URL. For example, a temperature sensor in a living room might post its current temperature on the following topic: Office/Hall/Temperature.

QUALITY CONTROL MECHANISMS

Another important concept is the three is the quality of service for data transmission 0, 1 and 2. MQTT is based on TCP, which is why both transmissions are very reliable. Nevertheless, this is not a sufficient solution for networks with many transmission errors due to connection problems, such as in mobile networks. Therefore, the protocol has built-in mechanisms that guarantee the successful transmission of messages. The assurance varies from no guarantee (level 0) to that the message will arrive at least once (level 1) to a guarantee that the message will arrive exactly once (level 2). The difference between level 1 and 2 is that at level 1 it can happen that a message reaches a client more often. Depending on the application, the appropriate level should be selected, because the higher the level, the higher the bandwidth required. [3]

LAST WILL AND RETAINED MESSAGES

Many problems can be solved with the possibilities of publish/subscribe and the use of QoS levels (Quality of Service). Since various clients lose the connection from time to time, it can happen that a mobile application that has reconnected does not know whether a temperature sensor is connected at all and what the current value of the sensor is. In addition, one does not know whether a sensor has failed. MQTT has the concepts “Last Will and Testament” and “Retained Messages” for these problems. When connecting, each client can send a message with its will to the broker, consisting of a topic and a message. As soon as the broker notices that the connection has been broken, it sends the message on behalf of the client. This only works if the application is connected at the time the sensor disconnects. A “retained message” can help here. It is a message stored by the broker and delivered to each client that reconnects and subscribes to the topic. Only one message can be saved for each topic. This can be used to store, for example, the last value of the sensor on the topic Home/Living Room/Temperature or the status of the sensor on Home/Living Room/Temperature/Status. This means that newly connected devices can also receive the last value, even if they were not connected at the time of sending. [5]

RECORD SECURITY

Due to the publish-subscribe architecture, MQTT has hardly any attack vectors when sending data to a specific client, since clients always initiate the TCP connection to the broker themselves and it is not possible to open the connections from the outside. This means that there are no risks when using network address translation (NAT), as is often the case in local

networks, for example. Devices don't have to (and shouldn't) be addressable via the Internet. Brute force and denial of service attacks on individual devices are difficult to carry out because the devices cannot be addressed from the outside. MQTT should always be used in conjunction with TLS so that all communication is encrypted. This makes it possible to largely avoid man-in-the-middle attacks, i.e., attacks in which a middleman can read or even manipulate data. To do this, the MQTT client must check the server certificate and ensure that it matches the desired MQTT broker and is trustworthy. The mechanism is the same as with HTTPS. When initially establishing a connection to an MQTT broker, a client can optionally use both a user name and a password for authentication. These two parameters are the basis for a simple credential-based authentication, but also for more complex authentication methods like OAuth 2.0. Depending on the range of functions of the MQTT broker, different authentication methods can be used.

CLEAN LOGIN

Authentication refers to checking the access data provided by the client at the broker. This makes it possible to determine whether the MQTT client is actually who it claims to be. For example, if a password does not match the specified username, the broker rejects the connection. MQTT sessions always begin with a client establishing a connection and the associated initial MQTT CONNECT packet. In addition to properties such as the unique client identifier, it can optionally contain a user name and password. In the simplest case, the client sends a user name and the associated password in plain text. In the best case, the broker does not have the password in plain text, but only the cryptographic hash of the password - SHA-512 is a suitable algorithm. This allows the broker to calculate the hash of the password transmitted in plain text itself and compare it with the known credentials. Of course, it is even better if the MQTT client only transmits its password as a hash and the MQTT broker never comes into contact with the original password in plain text. A basic principle for IoT devices should be that each gets individual access data so that administrators can block individual accesses if necessary. In professional MQTT installations, the credentials are usually managed centrally. Therefore, the MQTT broker often requires integration with external systems such as databases, LDAP directories or microservices. Professional brokers usually offer a plug-in system that allows integration with little effort. [3]

MQTT AUTHOTIZATION

In addition to authentication, authorization is an important concept for securing MQTT. Authorization refers to the granting of special rights and clarifies the question of what a specific client is allowed to do. Successful authentication of an MQTT client does not necessarily mean that it has permission to perform all actions. In concrete terms, MQTT developers usually restrict which topics a client can send messages for and which topics they can subscribe to. Without this authorization, a malicious client could subscribe to messages from all topics and thus read data that is not intended for it without authorization. In addition, such a client could itself send messages with any topic. Therefore, a clean application with MQTT absolutely includes protection with authorization mechanisms. MQTT brokers for business-critical use usually offer fine-grained authorization mechanisms. In addition, users should configure restrictions for each MQTT client, such as the maximum message size that a client is allowed to send and the maximum bandwidth for an MQTT sender. This ensures that no individual MQTT clients attempt to carry out denial-of-service attacks on the broker through software errors or malicious intent and, if successful, endanger the entire MQTT service.

CONCLUSION

Despite the delays in the standard, MQTT is an open and productive protocol whose main applications are in the area of the Internet of Things. The scaling to many thousands of simultaneously connected devices and the efficiencies in transmission and resource utilization of the devices provide a solution to problems that legacy HTTP cannot address. The display and alerting of live data from sensors on mobile devices and web browsers offer developers the

opportunity to increase the added value of their applications. The user thus has more up-to-date data and there are fewer costs on both sides. The company develops scalable communication solutions and web dashboards based on MQTT as building blocks for applications in the area of the Internet of Things and Industry 4.0. There are some basic security mechanisms that should be self-evident in every MQTT installation. This includes the fact that MQTT should never be used over the Internet without transport encryption via TLS - just as it has now become an anti-pattern to transmit unencrypted data on the World Wide Web via HTTP. Developers should definitely implement an authentication and an authorization strategy so that MQTT clients can receive fine-grained permissions and only trustworthy clients are allowed to communicate with the MQTT broker. MQTT can be used extremely flexibly. In order to make the use of MQTT secure over the Internet or locally, the protocol, like the Internet protocols HTTP or FTP, relies on underlying security protocols such as TLS. In addition to authentication via username and password, other measures such as using X.509 client certificates or OAuth 2.0 can be combined very well with MQTT. The additional use of user data encryption helps for critical and important messages. Basically, MQTT that uses measures presented in this paper can be operated quite easily and securely.

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STAFFING TECHNIQUES IN INDUSTRY 4.0

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Abstract: This paper gives a review of the changes that have happened over the past few years in the field of recruitment and selection one of the most important functions in Human Resource Management. The use of the Internet influences recruitment and selection practice and takes it to the next level. In the paper, the most recent trends in the field of recruitment and selection have been analyzed, and new models of resumes have been described.

Keywords: *recruitment, selection, techniques, digital era.*

1. Introduction

The use of technology in the workplace affects all segments of Human Resource Management especially employment since it raises recruitment into an entirely new sphere [Gregory et. al., 2013]. With the appearance of the Internet, online recruitment is becoming widely used and it not only has accelerated the process of recruiting external candidates, but it has also reduced expenses. Finally, it has enabled organizations to reach a larger number of candidates. The use of websites and social media has allowed organizations to communicate with potential candidates more informally. Considering the fact that the workforce is aging, modern companies must turn to the employment of generation Millennials to be competitive in the market, and social media can help them in these efforts.

Since the Internet and social media will be a part of our lives for a long time, it is crucial for organizations to understand the advantages and disadvantages of these tools in order to be able to use them for recruiting and selection process.

The authors of the paper analyze the most recent trends in employer recruitment strategies in the 21st century by reviewing the contemporary literature on the following topic. Moreover, we examine the differences between generations in an organization and the effect that their different values and attitudes have on human resources functions, especially on recruitment and selection. We also deal with other challenges and emerging trends that are going to make influence recruiting practice. Finally, we suggest a new model of resumes that can push the recruitment process to the next level.

2. The impact of generational diversity on the HR sector

Before we start talking about recruitment and selection processes in the digital era, we cannot avoid the analysis of generations that constitute the current labor force. Furthermore, we will analyze how generational diversity and their attitudes toward new technologies influence the work of human resources departments and which challenges they put in front of them. Technological changes have led to entirely new dynamics at the workplace.

Faced with more and more candidates from Generation Y or Millennials companies are constantly wondering whether they should adjust their employment practices to this generation. Even though this issue is the main preoccupation of managers, until now most of the research mainly dealt with the differences that exist among various generations in organizations [Parry and Urwin, 2011, Deal et al., 2010, Eisner 2005; Broadbridge et al., 2007; De Cooman and Dries, 2012].

Most authors claim that most members of a generation have similar attitudes that differ from the attitudes of other generations [Deal et al., 2010; Parry and Urwin, 2011]. The magazines (for example, Stein, 2013), HR consultants (for example, Mazars, 2012) and practical literature (like HR specialist, 2013) often state that there are differences in the tastes and preferences between generations. The members of a generation were born in the same period, they have

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experienced significant life events similarly during the crucial years of forming their personalities [Mannheim, 1952] and they share the same collective cultural field [Eyerman and Turner, 1998]. From the social cognitive aspect, according to the theory of socialization [Ward 1974], the individuals of every generation are influenced by the political, economic or cultural context in which they are developing and the historical events that shape their values [Mannheim, 1952]. Due to the power that these common events have, it is believed that each generation develops a unique set of beliefs and attitudes that influence their behavior (Rider, 1965). Moreover, each generation develops a unique form of behavior based on common experience [Kupperschmidt, 2000]. For example, Generation Y shares common events such as the fall of Berlin Wall, the 9/11 terrorist attacks, etc.

Four generations have been identified in western economies, and those are Veterans, Baby Boomers, Generation X, and Generation Y.

The progress in medicine and better quality of life have enabled us to live longer, stay healthier longer, and therefore remain at the workplace longer. The data from the last census in the USA show that 13% of the American population is 65 years old or older, and it is believed that the percentage will grow to 20%, or 70 million people, since 2030 [Society for Human Resource Management, 2020]. Since baby boomers live longer and stay healthy longer, 80% of this population plans to continue to work even after the age of 65 [Society for Human Resource Management, 2021].

This “gray labor force,” or Veterans, can create many challenges to organizations, and therefore to human resources departments. Older workers are often more resistant to changes, especially while introducing radically new programs and using new technologies that lead to a complete break from a long-standing way of functioning things. They can also enlarge the medical expenses of companies in comparison to their younger colleagues. Less opportunity for advancement is available to younger workers when older workers do not retire on time. Moreover, in many cases, older workers ask for bigger salaries even though they have skills and abilities that are less competitive comparing to the skills and abilities of their younger colleagues, especially skills that are related to the use of technology [Kwoh, 2012].

However, it is necessary to state that older workers can be very productive, and even more productive than their younger colleagues can. Society often tries to devalue more elderly citizens, and such prejudices can be found in an organizational context [Society for Human Resource Management, 2021]. However, older workers can be more loyal to their employers than their younger colleagues. They also possess significant knowledge about the organization and industry, as well as the key contacts within their professional network.

Baby boomers belong to the generation born between 1945 and 1962, and they are now in the middle of their careers. Employers have found out that the offer of the employees from this generation is bigger than their demand. As the members of this generation climb the hierarchical ladder for higher managerial positions, there are fewer available jobs at their disposal, and the struggle between baby boomers becomes fierce. Many organizations have been flattened, and many hierarchical levels have been eliminated with the expanding use of technology [Robinson, 2002]. Many jobs performed by middle-level management are now carried out by new technologies. Considering all these factors, it is clear that many of these individuals will never make any progress further than middle-level management. It can be very frustrating for baby boomers who have been employed in an organization for many years and who have seen their older colleagues making progress. This situation puts on significant challenges for HR in satisfying and engaging the baby boom generation. HR should find ways how to retain them and keep them motivated even though they have come to the point in their careers when they should make progress, and they cannot do that.

Baby Boosters are the sub-generation, the generation between Baby Boomers and Generation X. It is a generation born during the decrease of the birth rate in the period from 1963 until the middle of the 1970s. This generation should also have fewer expectations concerning the pace of their careers. Baby Boomers have created a bottleneck in the hierarchical ladder. Until the Baby Boomers does not retire, there are fewer opportunities for baby boosters to make career progress in larger organizations.

On the other side, Baby Boosters who usually occupy lower and middle levels of management often get higher salaries than some Baby Boomers. For many industries, and especially those that develop fast, such as multimedia and IT, this generation possesses skills and abilities that Baby Boomers lack. Due to this, Baby Boosters earn more than Baby

Boomers, and it is possible that employees in their 40s earn much more than their 20-30 year older colleagues [Babcock, 2021].

Generation X has created an entirely different workplace environment. Generation X includes employees born between the late 1960s and the late 1970s. Many of these individuals have grown up in divorced families and have developed a significant degree of tolerance and the ability to adjust. They have witnessed the members of their families being fired during economic crises, and it has influenced their limited loyalty to their employer. They have also used computers and other modern technologies all their lives, and since their early age, they have been exposed to constant changes in their daily lives. More importantly, they have attitudes and perceptions regarding work that are significantly different from the attitudes of the previous generations. It includes the expectation that they have more control over the work they perform. They regard themselves as independent consultants, and not as employees. They do not care so much to have a safe job, and they do not expect long-term employment. The important thing for them is to have the opportunity for personal growth and creativity at work [Harvey, 2000].

Despite variations among studies, the most common definition of Generation Y relates to the people born after 1982 [Strauss and Hove, 1991]. Other names used for this generation are: 'Millennials', 'Net Generation', 'Digital Natives' and 'Generation Next.' By some authors, Generation Y is also called "the Baby Boom Echo" because this generation consists of the children of the Baby Boomers [Ng et al. 2010]. Now Baby Boomers represent the largest generation among the current workforce. However, in 20 years their place is going to be taken over by Generation Y [Gillbert, 2011], which has just started to become a part of the workforce. Millennials are often described as a homogeneous group with values, attitudes, behavior or expectations different from the previous generations [Eisner, 2005; Ng et al., 2012]. It is often said that this generation is very educated, open-minded, optimistic, cooperative, influential and sociable [Raines, 2002]. As well as Generation X, they are very skilled and tech-savvy. Since most of them grew up in multicultural surroundings, they have a more global and tolerant view of life [Robinson, 2002]. They are often entrepreneurs. They do not wish to work from an office or to have an actual employer, and they are more willing to work on temporary projects [Society for Human Resource Management, 2020].

The employees from Generation Y appreciate collective and teamwork. They usually have a greater sense of social responsibility in comparison to other generations and value authenticity and transparency. They avoid a dictatorial leadership style, a rigid hierarchy, and a controlling system. They prefer a working environment where their contribution is wanted and where they can actively participate [Hughes, 2011]. Studies are less consistent regarding the expectations of Generation Y about salary. Some authors state that for Millennials salary is less important than other factors, such as a fulfilling personal life [Eisner 2005], while others state that salary is a critical dimension and the main worry of Millennials [Hite and McDonald, 2012]. Montgomery and Ramus [2011] emphasize that the intellectual challenge at work is more important for Millennials than the financial package. Tyler [2007] claims that challenging work and opportunities to develop professionally are the things that Generation Y asks for from their employers. He believes that both factors are more important than salary.

Generation Y is in the focus of attention due to the fact that they are just becoming a workforce and have different needs from the previous generations. Table 1 shows some of the key differences between generations that are currently a part of the workforce [Sbatini et al., 2020].

Table 1. Generations in the Workplace. [Sbatini et al., 20020, pp. 205]

Generation	Percentage of Workforce	Contributions	Leadership Preferences	“Fit” Sought
Traditionalists (1922–1945)	8%	Diligent, stable, loyal, detail oriented, focused, emotionally mature	Fair, consistent, direct, respectful	Contribution (experience, balance, caring)
Baby Boomers (1946–1964)	44%	Team oriented, experienced, knowledgeable, loyal	Equality, democratic, personable, mission-focused	Relationships (security, coworkers)
Generation X (1965–1980)	34%	Independent, adaptable, creative, non-conforming	Direct, competent, informal, flexible, supportive	Job (challenge, participation, outcomes)
Generation Y/Millennials (1981–2000)	14% (increasing)	Optimism, multitasking, socially responsible, diverse, tech-savvy	Active, mentor, motivational, organized	Culture (progressive, autonomous, flexible, fast paced)

During the last couple of years, Generation Y has entered the labor market and that fact raises many questions regarding their attitudes toward work and ways that organizations can attract and retain them. From all the aspects of managing human resources it is clear that there is a great difference between Generation Y and other generations.

The question that most companies face today is how to attract employees that belong to Generation Y. According to the studies dealing with recruitment and selection, searching for a job is a dynamic process of decision-making in which business and organizational attributes influence the final decision of the candidates [Montgomeri and Ramus, 2011]. Moreover, they are significant predictors of candidate reactions in all phases of the employing process [Taylor and Bergmann, 1987]. These attributes are dominant since they have a direct positive influence on the candidate's attraction and their decision to accept or refuse a job offer [Turban et al., 1998]. Many studies have tried to identify a connection between job attributes and candidate preferences for a job. As for Millennials, some studies emphasized their particular expectations regarding job characteristics, reviewing each attribute individually. Based on these studies, Generation Y search for a collective management style, an organizational culture that will support them and for a positive work environment [Eisner 2005; Broadbridge et al., 2007; De Cooman and Dries, 2012]. Generation Y should also love a stimulating work environment that offers the possibility to make progress and long-term career development [Eisner, 2005; Broadbridge et al., 2007; Terjesen et al., 2007; De Cooman and Dries, 2012; Hite and McDonald, 2012]. They will be attracted by an organization that invests in the training and development of its employees [Broadbridge et al., 2007; Terjesen et al., 2007; Martins and Martins, 2012] and ensures different work on an everyday basis [Terjesen et al., 2007]. According to Cennamo and Gardner [2008] and Hite and McDonald [2012], they also need autonomy and independence. This generation values a balance between work and personal life, and personal enjoyment and especially fresh graduates pay particular attention to these things [Eisner, 2005; Cennamo and Gardner, 2008; Hite and McDonald, 2012].

In the next section of the paper, we are going to analyze how the entrance of Generation Y on the labor market and how a greater use of modern technologies has changed a complete approach to the process of candidate recruitment and selection.

3. Evolution in recruitment

Not so long ago recruitment was a much simpler process. Hireology, a leading organization for talent assessment in the USA recently released an infographic titled “The Evolution of Finding Candidates” that provides a fascinating account of how recruitment and selection have evolved over time. Employee referrals date back to ancient Rome, and the first candidate recruitment happened in 49 BC. Between the 1950s and 1980s, 75% of the candidates were sourced from newspaper ads. The 90s were the decade of the Internet job boards. Careerbuilder was founded in 1995. In 2000 recruiting turns to the Internet. In 2002 6% of job seekers used the Internet, in 2003 46% used the Internet, and in 2006 even 96% of job seekers used the Internet. In 2001 96% of large companies had official websites for recruiting [Cappelli, 2001]. Since 2012 the Internet has been the primary source that companies have used for recruiting candidates [Borgerson, 2020].

Nowadays recruiting has not changed as a process, it is still the same – a vacant workplace needs to be filled with the best possible available candidate. The environment, society, tools and technologies that are used for recruiting have changed. The behavior of the employees, expectations, and generations have changed, and therefore organizations need to modify the way they recruit talent.

Dessler defined employee recruiting as “finding and / or attracting candidates for open positions in an organization” [Dessler, 2021, pp. 146]. Traditionally, this concept referred to the employers and not to the employees. Today this definition also includes those who seek a job. Some time ago candidates struggled to attract the attention of recruiters, and nowadays recruiters struggle to draw the attention of potential candidates, and they use the Internet and social media for that purpose.

The transfer of the market’s focus from the employer to the candidate will demand the organization to reshape the function of recruiting and make it a well-designed marketing machine that can nourish long-term relationships with the right candidate. Traditionally, it was believed that recruiting is a function within HR. Today it is thought that recruiting is a marketing challenge since finding and keeping talented employees does not differ much from finding and keeping buyers. Traditional recruiting needs to include in its function the component of marketing and the most important tool is social media.

Traditional ways of recruiting enabled companies to advertise their vacant positions to potential employees. New technologies and social networks enable potential employees to advertise themselves on the sites or social platforms of potential companies. In addition, recruiting has now become much more than a way to fill the positions. Among other things, it implies the involvement of candidates in creating a positive image of the company.

Research concerning the recruitment and selection of candidates have become immense [Breaugh, 2008], but there are still not enough research on the topic of using the Internet and social networks for recruiting. So far only a few authors from the area of human resources and organizational psychology dealt with this subject [Cober et al., 2004; Highhouse and Hoffman, 2001; Levis and Harris, 2003; Boswell et al., 2003; Dineen et al., 2007].

4. Recruitment through websites

One of the important mechanisms of online recruitment is company’s website that often has a significant role in recruiting candidates [Afolabi, et al., 2018; Chapman and Webster, 2003]. Chartered Institute of Personnel and Development [2009] states that 75% of big-brand companies use their sites for attracting candidates who are interested. They also state that big companies like to use their sites more than sites such as Monster and HotJobs. Companies prefer to use their sites for recruiting since these platforms can generate many applications from unqualified candidates [Steel, 2007]. These sites would have greater significance if they could give feedback on how a potential candidate fits in the organizational culture [Hu et al., 2007]. According to Gregory et al., [2013] research show that 50% of the new employees have been recruited through the Internet [Cober and Brown, 2006], and it is estimated that organizations that use e-recruiting cut their expenses by even 87% [Maurer and Liu, 2007].

Melián-González and Bulchand-Gidumal [2017] shows in Glassdoor research shows that when candidates have access to information about a job and company—before deciding

whether to apply or accept a job offer—employers have seen an approximate average of 22 percent reduction in turnover.

Organizations that use sites for employees' recruitment should make sure that the sites are attractive and easy to use [Rynes and Cable, 2003]. Some authors in their studies have analyzed the characteristics of sites that influence the decision of a potential candidate to apply for the position within the organization [Braddy et al., 2003; Cober et al., 2003; Cober et al., 2006; Coyle & Thorson, 2001; Williamson et al., 2003; Zusman & Landis, 2002; Gregory et al., 2013].

Braddy [2008] in his study focused on how a website should be designed and what kind of content it should have to make a positive impression on a candidate looking for a job. He also tried to determine what kind of website content could be the best in order to show a candidate to what extent he fits in the organizational culture [Braddy et al., 2008]. Gregory et al. [2013] concluded that it is paramount that the site is user-friendly, nicely designed, and has precise and accurate information about the company. He also determined that there is a relationship between the candidates' attitudes towards the company's site through which they are employed and the relationship towards the organization. In other words, a poorly designed site with insufficient and inaccurate information has a negative impact on the company's image. The negative company's image leads to decreasing of the number of candidates that are interested in applying to open positions within the company [Gregory et al., 2013]. One of the most detailed studies regarding this subject has examined the relationship between the candidates' attitudes towards the organization and its website and finally how it affects their intention to apply for the position in the organization [Afolabi, et al. 2018].

There are also sites where it is possible to leave a comment about the current employer which greatly helps future candidates. Van Hove and Lyeveens [2007] determined that available information about companies on an independent site is more precise and valuable than those offered on the company's site. On these sites, comments are not left only by the employees, but the candidates can also share their experience they had with a company while applying for a job. Public Ranking and Rating platforms, such as Yelp, Netflix, Amazon, and Glassdoor make us realize the importance of the opinion that candidates and employees have about the company. The comments on these sites have a major effect on the company's image. We may say that the time has gone when the organizations treated the candidates badly without anyone having the information about that.

5. Social Media Recruitment

Most organizations today employ Millennials which significantly influences the techniques and tools they are going to choose to recruit, select and motivate them [Solnet and Hood, 2008]. There are few studies regarding how social media are used for recruiting Millennials. Since they use social networks a lot, it is most logical that these tools are also used for their recruiting. Solnet and Hodd [2008] claim that organizations can become more attractive to potential Millennials employees if they start using social networks for communication with them.

Many companies motivate their clients, and therefore their potential employees, to connect with them on social networks. In this way corporations can through informal conversation present the opportunities for employment in their companies and motivate potential candidates to apply for a job. They can also find out more about their potential employees by studying their profiles on Facebook, Instagram, LinkedIn, and Twitter. On the other side, potential employees can find out more about the organizational structure and culture of the company and receive more information about the company from its employees on social networks. Candidates can sometimes learn more about the organization on the basis of some informal comments on social networks than through the formal ways from the organization.

When used successfully, recruiting through social media can improve the employer's brand and can give the organization a new, modern identity. Social media can certainly influence the activities of recruiting in many organizations, but they should be managed carefully and the proper processes and technologies must support them.

Holland [2021] in his article stated the advantages and disadvantages of the use of social networks in the purpose of recruiting. He emphasizes that when companies use social media for recruiting it is crucial that they maintain the communication with the candidates in all phases

of employment. Recruiting through social media enables faster communication, more rapid responses and has a personal note since through social media you communicate with a real person and not with a machine [Holland, 2021].

While using social media for recruiting it is essential to plan and to know which group of potential candidates is the target, and based on this one will know which media channel to choose. The selection of the proper media channel does not depend only on the type of candidates we want to attract but also on the industry and country in which we do business.

Social networks that recruiters and job seekers mostly use are Facebook, Twitter and LinkedIn. It is not secret that LinkedIn has had a meteoric rise to prominence in the job space, but the importance of social tools is becoming apparent across more avenues. Facebook in 2020 launched a job search tool that aggregates posts from external sites and adds a social layer [Facebook, 2021]. Twitter has long been a place to connect with people in your industry, and this channel will become more important as traditional job search methods lose their appeal.

The research has shown that most of the job seekers (83%) use Facebook when they look for the job while recruiters (65%) don't rely so much on this media when they search for the candidates. On the other hand, 94% of recruiters is active on LinkedIn while only 36% of job seekers use this social media. (Figure 1)

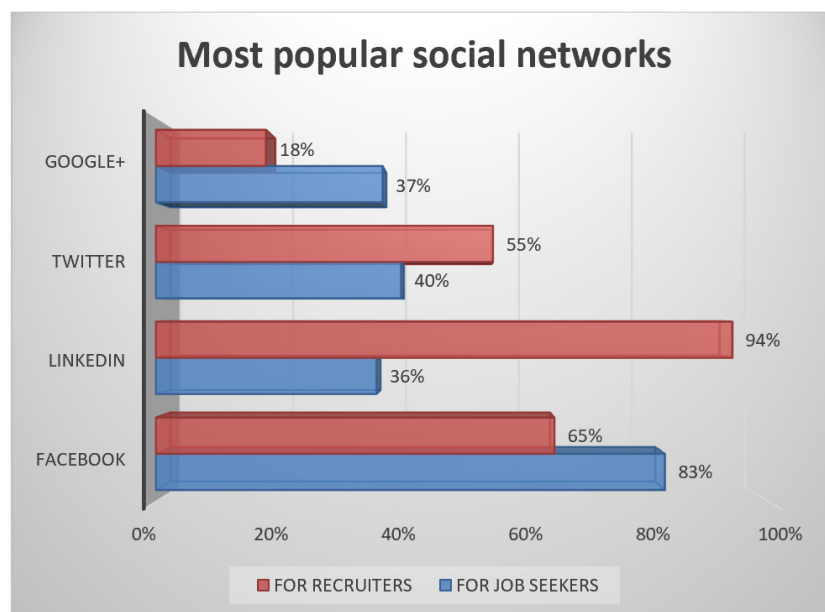


Fig. 1. [Jobvite, 2020, pp.5]

We expect to see traditional job boards to collaborate with existing social networks or develop their social tools (e.g. ratings, recommendations, social connections to the company, etc.) to complement their current offering. As most career coaches tell, it is just as much about who you know as what you know, and these social elements enable job seekers to build their network in a targeted manner.

5.1. Facebook

Facebook is the most famous and influential of all social networks, with 1.28 billion of active monthly users, and 802 million of active daily users based on the information from January 2021 [Facebook, 2021].

Shahid [2019] and his associates suggested making a Facebook fan page that would be used for recruiting (Fig 2). His idea was that Fan page would not only attract potential candidates, but it would also encourage them to apply to open positions when they occur. This strategy consists of three steps: Attract, Care and Initiate, that help employers use Facebook for recruiting students that are about to graduate. With Attract strategy the employer will identify and attract potential candidates to the Fan Page. In the next phase, the employer will develop Care strategy to provide appropriate content interested to the fans. The aim of this strategy is to make sure that the fans are interested in our company and that they frequently visit the Fan Page. The content will mostly consist of something that is useful to students in their search for

jobs. The last step, Initiate, is the most important since it motivates graduates to apply when there is an open position in a company. The last step is crucial. The initiate strategy is based on the theory of planned behavior [Ajzen,1991].

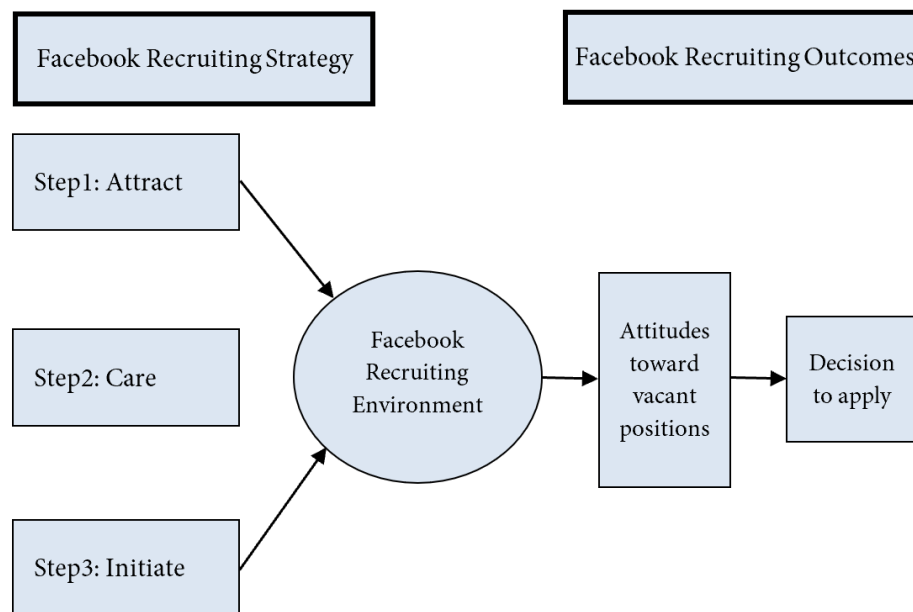


Fig. 2. Facebook recruiting strategy [Shahid, 2019, pp. 136]

5.2. LinkedIn

On the other side, LinkedIn, as a professional social network, is often used for recruitment. LinkedIn was founded in 2002 and presents a professional social network with 65 million registered users in over 200 countries and territories all over the world [Doherty, 2010]. Companies advertise their vacant positions through LinkedIn. It is mostly used for search of passive candidates. Recruiters search the information about all 65 million members of LinkedIn, and by doing so, they can proactively target passive candidates more efficiently.

5.3. Twitter

Twitter is often used for advertising vacant workplaces and by using hashtags targets a particular group of people.

IT companies all over the world currently face a significant problem of recruiting talented employees and to succeed they use all possible means of recruiting that are available. One of the leading IT companies in India, HCI with 31 branches all over the world, when faced with this problem, decided to start an aggressive campaign on Twitter to attract talented young people from generation Y. The campaign was called #coolestinterviewer and they interviewed through Twitter candidates for five positions in the company. 250000 candidates from 60 countries all over the world participated in the campaign. After the campaign had finished, the company had 200000 followers on Twitter more than its competitors had. The campaign was the breaking news on 60 national and international media which had the commercial value of US \$1 million [Kumar and Srivastava, 2016]. It is just one of the examples how companies can efficiently use Twitter for recruiting with minimum expenses.

Although Facebook, Twitter, and LinkedIn are the most common social media channels used for recruiting, there are also some other channels that are being used. For example, Oxfam uses YouTube to advertise open positions and to show what skills and abilities are needed for the candidates in order to apply [Holland, 2021].

6. The use of social media for selection and screening

Research shows that more and more human resource managers use social networks for screening candidates [Klark and Roberts, 2010]. Lately, some organizations started to deal with

issues concerning under which circumstances or how recruiters should use social media for choosing candidates for the job or monitoring current employees [Smith and Kidder, 2010]. Caers and Castelyns [2011] claim that employees during the process of selection should consider only factors that are connected to the job. Since individuals post information about themselves on social networks, they are available to organizations in which they apply for positions. Thus, it is possible that even before a candidate is asked for an interview the information from the social network has created prejudices about the candidate [Caers and Castelyns, 2011]. Inappropriate photographs and profiles sometimes reduce chances for the employment of the candidates [Newcombe, 2013].

It can be said that the decision of the employer to investigate all available information about the candidate is entirely legitimate from the point of view of the screening process [Pate, 2012]. Some studies [Kluemper et al., 2012] have shown the connection between employees' performance and their Facebook profile of the employees.

Many organizations consult LinkedIn which is a professional social network, and through this social network, they can see the qualifications of the candidate and their career history. However, more and more organizations turn to Facebook for recruiting, even though this is not the primary aim of this social network [Smith and Kidder, 2010]. Screening of the candidates through Facebook, Twitter, and Instagram is often used to understand better the character of the potential employees, their personalities and to see if they will be able to fit into the organizational culture.

Potential legal problems may occur during the use of social media for recruiting and selection. From the perspective of the employee, it may be considered discrimination or an invasion of privacy. It is doubtful which information can be regarded as information related to the business life of the candidate, and which to the private life. The main difference between Facebook and LinkedIn is that Facebook focuses on connecting to friends and information exchange, while LinkedIn enables professionals to connect, advertise their skills and share information concerning their work. Caers and Castelyns [2011] conclude that Facebook belongs to the private sphere of an individual, whereas LinkedIn belongs to the business sphere. Accordingly, the employers should be focused more on the use of LinkedIn than on Facebook while screening candidates.

Moreover, the use of social media for the process of selection of the candidates raises the question regarding the reliability of the information that can be found on them. Many psychological studies have shown that people tend to self-promote on social networks and that they often post inaccurate information or exaggerate it [Buffardi and Campbell, 2008; Epstein, 2008].

When candidates are applying for an open position, they must be aware of both positive and negative sides that profiles on social networks have. An online identity has a significant influence during the process of recruitment and selection since the first impression, whether positive or negative, can have a huge effect on the further process of selection.

7. Conclusion

The use of the Internet and social media has significantly changed the way the companies recruit the candidates. It is essential for companies to shift their focus from gathering CVs to a more personal form of recruiting. If companies are not able to do that, then they would have to reconcile with the fact that top talents will build a relationship with their competitors not with them.

Ordinary resumes are becoming more useless to recruiters. Rynes et al. [2003] said that the real skills of people are not in correlation with what is written in the resume.

It requires more time so that companies would completely understand the challenges that online and social media recruiting carry with them. It would be good to make procedures and manuals for the use of social media and the Internet for recruiting. These procedures should also include the legal implications that this type of recruiting may have.

HR departments would have to cooperate more with other departments. IT departments may help them in creating websites for recruiting, and marketing departments in making a strategy for online communication. Finally, HR recruiters would have to master some new skills to be able to successfully use the Internet and social media for attracting potential candidates.

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HATE SPEECH AND DISINFORMATION CONTRARY TO ETHICS AND MEDIA EDUCATION

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Abstract: In the conditions of accelerated information-technological progress, ethical principles began to be lost. This is best reflected in the existence of hate speech and the spread of misinformation in the media space of the global village, as the world is today. The Internet has opened up a free media space, but it has not introduced a sufficient number of regulatory bodies that could eventually select or completely eliminate certain content, such as hate speech and misinformation. In this paper, one will try to point out the global problem concerning the expansion of a free, non-selective and non-critical digital space.

Keywords: *ethics, media, hate speech, misinformation, media education.*

Introduction

When one talks about ethics, ethical principles and norms, topics that inevitably arise are the questions of morality, evaluation criteria, codes of conduct, ethics of the spoken word, integrity, and media education within the media space. Media education and media literacy arose as a result of the need to indicate a critical reflection on the ethical standards of spoken or written words. Here it can also be talked about media propaganda, fake news, plagiarism, unnamed sources and tabloidization, all in the context of bad media practice. Ethics that is in opposition to violence, fight against misogyny, degradation, unverified information, thus is on the side of children, preserving the identity of the victim, when it comes to hate speech.

Ethics

Ethics is a philosophical discipline that studies morality, in terms of criteria for human evaluation and preservation of personal integrity. Like any other discipline that stands for honesty, correctness, reliability, precision, verification, it is often under attack from opposite values. Ethics is a feeling of what is valuable and good. Violation of ethical rules in media, journalistic practice causes mental pain, especially if it is about hurting other people's emotions, hate speech, discrimination. Although media freedom is an ideal to strive for, and the Internet has made almost complete freedom possible, it is ethical standards that point to responsibility, correct decision-making and common sense.

There are personal, business and institutional ethics. Personal ethics advocates for the preservation of the personal integrity of each individual. It contains those values that are woven into a person from birth, genetically, hereditary, and some are acquired during life, through socialization, education, and level of maturation. Not all people have the same predispositions, ethical norms and criteria for evaluating life events, but the aspiration is to strive for universal ethical principles based on justice, truth and honesty. When talking about business ethics, within each media house, news agency, editorial office, there is a system of rules and norms for functioning. Journalists are people who must respect ethical principles and standards in order to adequately perform their work. Their duty is to behave in accordance with professional ethics, and primarily personal ethics. According to the authors of the book *Mass Media*, Goran and Ljiljana Bulatović: "Style instructions or "Broadcasting rules" are distributed to editorial staff members as work instructions¹." The same authors further state that: "large media houses have departments that deal with broadcasting standards. Those departments also have the function

¹ Bulatović, G, Bulatović, Lj. (2009): *Masovni mediji*, Cekom, Novi Sad, str. 263.

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of censors.”²

The system of self-regulation is also important, when the media company itself regulates the work of its employees through responsible behavior. “Self-regulation or media responsibility occurs where journalists and publishers jointly establish rules of journalistic conduct and ensure that those rules are respected.”³

Above all previously mentioned stands institutional ethics, under whose auspices are personal and professional ethical rules and norms of behavior, which also deals with censorship as part of its activities.

“Today’s media dictates the audience’s taste.” In addition to unhindered promotion of current and important topics, they also influence and change the attitudes of the audience through a certain selection and choice of topics.”⁴

Hate speech on social networks

Contrary to ethical standards, hate speech is a category of public discourse that has established itself on social networks, which is impossible to control to the same extent as when it comes to traditional media. New media, the emergence of the Internet, opened up a heavenly, media space, in which information moves at the speed of light and is impossible to control, because everything happens on a global level! Starting with twitter, facebook, instagram, tiktok, news portals, web platforms and other Internet content, almost the entire world population has succumbed to the influence of an unchecked amount of content that creates human consciousness, opinion, reshapes and dictates the actions of human behavior, especially the younger population.

Hate speech on social networks has a predominant role and must be prevented. Violation of privacy, degradation of human character and actions, insults, theses about political, racial, religious, gender, sexual intolerance go beyond the framework of normal, human understanding. “Therefore, we do not have a dilemma whether a topic will be put on the agenda, but in what way it will be presented to the audience and with what goal.”⁵

One is witnessing the anonymity of sources, which further threatens the credibility of the media. Are there sanctions for abuse of media space? Who is responsible? Can legal regulations, judicial authorities and to what extent have jurisdiction over cases of Internet violence? Children are one of the most vulnerable categories of Internet violence. They can’t deal with so much pressure on social media, hate speech, and it often ends in a fatal outcome! The question is who is responsible?!

It is a fact that the average person spends around thirty percent of the entire life time in front of some media and that the media largely shapes human consciousness, but how can the media be properly “consumed”?

Media education and literacy

The issue of media education was raised in the early seventies of the last century. UNESCO raised the issue of education for the media, and then a series of topics, polemics, and discussions on that topic followed. Media literacy is a key factor in properly understanding media content. Individuals must not receive and adopt media messages without knowledge of techniques, technologies, institutions, methods that deal with media production. A critical review, a critical approach to media content must be developed. The skill to decode the message, to critically analyze it, is necessary in order to understand the complex relationships between the audience, the message and the world.

The author of the book “Journalism and Literature”, Nada Torlak cites a study on media literacy by James Potter in which it is said that: “most people today allow the media to program their habits and ways of seeing the world. A low level of media literacy enables access to the

² Ibid.

³ Ibid.

⁴ Vojinović, M. (2022): Media representation of gender (in)equality through the prism of print media-violence against women in a partner relationship, *Art without borders*, Bar, p.33.

⁵ Ibid.

message, but not protection from the barely noticeable, yet constant shaping of life perception. (Potter, 2011).”⁶

“The structures of public opinion are different, and therefore the understanding of the marketed information is different from the moment when it is heard, from the source to the process of transmission to the target, end user.”⁷

The recommendations are to introduce media education and media literacy in primary and secondary education, as well as in institutions of higher education, in order to enable young generations to be familiar with the rules of reading and interpreting media messages from an early age, to enable them to have a more correct and clearer perception reality and the development of critical, selective thinking.

Conclusion

From the early beginnings of the development of media structures and organizations, many centuries have passed, and the media have always fought for independence, freedom, freedom of public speech, space, and today one is brought to a situation where the freedom of the media must be defended by law. Hate speech, misinformation, plagiarism, uncredited sources, the Internet, contributed to the fact that media placements of this type receive their epilogues in judicial bodies and that legal measures and regulations must be used against hate speech on social networks. As a result, ethics, ethical norms and principles, media education, literacy along with the judiciary and judicial bodies must stand on the fenders of public discourse in the media space. Selection and criticism versus hatred and discrimination.

The intention of the authors of this paper is not to answer all possible questions and problems that inevitably arise from this topic, but to present the real situation and draw the public's attention to the use of ethical public discourse in the free media space.

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